THE IMPACT OF MARKET PHASES AND CRISES: EVIDENCE FROM THE DHAKA STOCK EXCHANGE

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Abstract

This study examines herding behavior in the Dhaka Stock Exchange using the Cross-Sectional Absolute Deviation (CSAD) model developed by Chang, Cheng & Khorana (2000) supplemented by several robustness tests. A longitudinal research framework has been adopted, utilizing daily closing stock price data over a ten-year period spanning from January 1, 2015, to December 30, 2024. Unlike prior studies conducted predominantly in developed or other emerging markets, this research applies the CSAD model to the Dhaka Stock Exchange, which operates under a different regulatory environment and market structure, thereby enriching the cross-market understanding of herding behavior. The empirical findings confirm the presence of herding behavior in the Dhaka Stock Exchange. The study further reveals that herding behavior becomes significantly stronger during periods of global financial crises compared to normal market conditions. However, no statistically significant evidence of herding is found during domestic crisis periods. The analysis also indicates significant herding behavior during general bullish market conditions, although herding does not intensify during extreme bull phases relative to normal periods. In contrast, herding behavior is significantly pronounced during bearish market conditions and becomes more intense during the extreme bottom 5% and 10% market downturns. In addition, the results show that herding behavior persists during both high and low trading volume periods. The study also identifies the persistent nature of herding, suggesting that current herding tendencies are influenced by previous market behavior. Overall, the findings offer important implications for investors, regulators, and policymakers by enhancing the understanding of investor behavior and contributing to the improvement of market efficiency in Bangladesh.

Keywords : *Herding Behavior; Behavioral Finance; Market Phases; Financial Crises; Bull and Bear Markets; Dhaka Stock Exchange; Emerging Stock Markets, CSAD, COVID-19 Pandemic, July Uprising.*

JEL Classification : *G41, G14, G01, G12, C58*

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1. INTRODUCTION

Herding behavior refers to a social phenomenon or behavior seen among individuals in a cluster who tend to accompany, mimic, or replicate the behavior, beliefs, or actions of the group they belong to or of the person who holds a better position than they do (Hon, Moslehpour & Woo, 2021). Herding occurs when an individual gives up his or her own will or thought, or belief to the majority. It is caused by economic and social factors, and having a leader is not necessary. Herding occurs due to peer influence, social pressures, and fear of missing out. The share market is a risky place to invest one's savings. There is high pressure to lose money with respect to risk. The return of risky assets is uncertain. The stock market is usually volatile, and any uninformed decision can lead to high losses (Spyrou, 2013). Thus, investors need to make decisions carefully. Several studies have been done in this field and on this topic as well. Most of them identified the occurrence of a herding stock market within different regions (Lao & Singh, 2011). Some studies have been done in the Dhaka Stock Exchange. However, the problem with the existing studies is that they are limited to a specific industry or do not incorporate recent data or the impact during the crisis (Khan & Imam, 2023). Unlike prior studies conducted predominantly in developed or other emerging markets, this research applies the Chang, Cheng & Khorana (2000) CSAD model to the Dhaka Stock Exchange, which operates under a different regulatory environment and market structure, thereby enriching the cross-market understanding of herding behavior.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 Literature Review

Herding behavior, or instinct or herd mentality, implies to the behavioral inclination of individuals to conform their actions to those of a large group, even if it refutes their own judgment (Kameda & Hastie, 2015). This leads to irrational judgment or behavior. However, there are some contradictory assumption, e.g., the basic assumption in economic theory is that investors are not irrational and that they make rational decisions. This implies that investors utilize all the available market information and make informed decisions (Arrow, 2018). This assumption has relied on another standard assumption, the "*Efficient Market Hypothesis (EHM)"* of the stock market, which is that there is *"no information asymmetry"* in the market; thus, investors possess equal information and make rational decisions (Naseer & Bin Tariq, 2015). However, access to information is not uniform; in real life, information asymmetry exists in the stock market.

Komalasari et al. (2022) provided a structured knowledge of herding behavior following the existing empirical studies on herding behavior in financial markets. This study offers direction to future research that classifies empirical research and aims to build a knowledge structure for herding behavior in the capital market. This study focused on effects, causes, gaps, and potential research directions. It conducted a systematic review of more than 80 papers' literature review over 20 years. It contains vast evidence on herding behavior and a guideline to start work on

it. Scharfstein & Stein (1990) presented the theoretical model of herd behavior. They identified that managers are more prone to mimic others, even though the available private information suggests otherwise. The reason they suggested is the career concern of the managers, which can be put in the way of "Wrong with the Crowd" rather than *"Wrong Alone"*. This paper did not testify to any empirical models or evidence; rather was based on a theoretical model that focused on the *principal-agent framework*.

Devenow & Welch (1996) described the economics of rational herding in financial markets. They focused on cascades, informational externalities that apply when action becomes more visible than private information. Where agents tend to follow previous agents when they hold limited private information. Through the theoretical synthesis of literature reviews, they suggested that rational herding can occur even when all agents are smart. This is because information asymmetry exists in social learning, since not everyone has the same level of information. They distinguished among reputational, informational, and investigative herding; however, their conclusion is inconclusive. Informational herding takes place when people believe more in collective knowledge rather than their own data. Reputational herding is related to career to avoid the risk of being wrong than the crowd. And investing herding occurs to save the data cost and focus on the same assets as others.

Grinblatt, Titman, & Wermers (1995) analyzed mutual fund behavior against past portfolio performance and herding. In this empirical study of herding, it was identified that 77% of momentum investors bought past winners' stocks; however, they did not sell the past loser stocks. Thus, it identified strong evidence that funds were invested during the momentum herd, on average. They used momentum measures, statistical inference, herding measurement based on overlapping trades, and fund-level panel data analysis. Concentrated flows into stocks can be used to track herding, in the case of institutions. Wermers (1999) addressed the same question, whether heading exists in the case of mutual funds, and concluded that mutual fund trading in average stocks does not present large herding, and herding is more visible or prominent in the case of growth-oriented mutual funds and the trades of small stocks, rather than the income-oriented mutual funds. Wemers (2019), used actual transactional-level data of all the available mutual funds over 20 years and used an empirical model, such as the *"measure of herding"* developed by Lakonishok, Sheilfer, & Vishny (1992), to test the herding impact on the stock price. In the process, this study also confirmed that mutual fund herding accelerates the price-adjustment process.

The process of studying herding behavior became more advanced and standard after the introduction of Cross-Sectional Standard Deviation (CSSD). It was first proposed and used by Christie & Huang (1995) and has become one of the first empirical models of herding. CSSD measured the dispersion of returns and suggested that when herding behavior occurs, the return dispersals of individual securities would be reduced. They also argued that when the association between Cross-Sectional Standard Deviation and extreme market conditions is positive, there is no CSSD, stipulating the fact that herding behavior exists or occurs during large price movements.

The CSSD model developed by Christie and Huang (1995) was further extended by Chang, Cheng, & Khorana (2000) and formed the CSAD (Cross-sectional Absolute Deviation). This study examined herding behavior in multiple countries' stock markets, including the USA, Japan, Taiwan, Hong Kong, and South Korea. In the cross-sectional standard deviation model, linear association was accounted for by examining the association between the dispersion of individual returns and the return of the market portfolio. However, in this study, a non-linear association is tested between these two variables. It proposed that the association between the return of the market portfolio and the dispersion of individual returns should be non-linear and negative when herding behavior exists, due to the consideration of the absolute market return value. When the market return of the portfolio increases, CSAD decreases or increases at a decreasing rate. It identified significant herding in emerging markets, whereas less in the developed markets.

Lao & Singh (2011) examined two markets, including the Chinese and Indian Stock Markets. The findings of the study identified that in both markets, herding behavior exists. However, the level of herding is not the same, but rather depends on certain market conditions. In the case of the Chinese market, herding is prevalent in both high trading volume and a falling market state. However, in the Indian market, it is identified as existing during upswings. Both markets justified herding behavior in the large market movements, but the Indian Stock market has a lower prevalence of herding behavior. They used the average CSAD model. Kallinterakis & Lodetti (2009) identified different outcomes in their study of herding. They followed a non-linear model and ran the test on the New Securities Exchange of Montenegro from 2003 to 2008, focusing on investigating the impact of low trading volume and identified no record of herding. They emphasized that market illiquidity and thin trading affect dispersion patterns of return. Market thinness results in distorted dispersion of return but has no impact on herding.

Following the same approach as Chang, Cheng, & Khorana (2000), Khan & Imam (2023) carried out a study on the capital market of Bangladesh that included 169 stocks listed on the Dhaka Stock Exchange. This study identified herding behavior in the Dhaka Stock Exchange. Furthermore, this study examined it from a different set of conditions and ran conditional model testing regarding trading volume. The conditional test identified asymmetric tendencies. Depending on the market conditions, the strengths of herding varied. It found that during large trading activity in the market, an increase in the herding behavior was observed among the investors of the Bangladesh.

Another study in Bangladesh's stock market was done by Islam (2022), but it only focused on the Banking industry of Bangladesh. He not only looks for the existence of herding but also for the nature of herding behavior in this sector. This study considered 30 listed commercial banks under the Dhaka Stock Exchange (DSE) across 12 years of closing price data from 2007 to 2018. This study confirmed herding behavior in the banking sector for the study period. One insightful piece of information that was found from this study was that herding occurred in the case

of the domestic financial crisis, but not in the global financial crisis, like the market condition during COVID-19 period. This study separated the study period into rising market conditions and declining market conditions and found asymmetry in herding behavior in several market conditions. This also confirmed the bull and bear phases. It identified that investors in the banking industry tend to avoid their own knowledge or private information during the bull period, and they try to avoid following the crowd in the bear period.

Ahsan & Sarkar (2013) used a different methodology from the methodology of Chang, Cheng & Khorana (2000), where they used the DSE all-share price index to measure the market return. This identified no herding phenomenon in the Dhaka Stock Exchange. In the methodology, they did not mention that they adjusted return data for stock dividends, cash dividends, or rights shares. They used both CSSD and CSAD models to test the daily data from 2005 to 2011. A similar study was undertaken by Saha (2019) on the DSE30 index using the "Cross-Sectional Absolute Deviation" (CSAD) approach to investigate herding behavior. The study identified no overall herding impact in the Dhaka Stock Exchange except for some minor herding signals during up markets or high volatility markets. This study considered the DSE30 index, which rarely represents the overall Dhaka Stock Exchange or the Dhaka Stock Exchange (Saha, 2019). Thus, it failed to answer the question of herding for the overall market. Besides, like Ahsan & Sarkar (2013), this study did not specify if the daily return was adjusted for cash dividends, stock dividends, or right shares. These two studies confirmed the rational decision-making power of investors in Bangladesh, which is misleading. Several studies identified that the Dhaka Stock Exchange is inefficient (Arefin & Rahman, 2011; Mobarak, Mollah & Bhuiyan, 2008; Ahmed, 2002), and most investors are less informed (Rahman, Hossain & Habibullah, 2017; Nguyen, Islam & Ali, 2011).

Christie & Huang (1995); Chang, Cheng, & Khorana (2000) provided models to run statistical tests and were the first to use cross-sectional standard deviation (CSSD) and cross-sectional absolute deviation (CSAD) models to test herding. These two pieces of literature evidence provide a basis for this study to understand the CSAD model.

Although extensive international literature exists on herding behavior in financial markets, empirical evidence regarding herding behavior in the Dhaka Stock Exchange remains limited and inconclusive. Previous studies conducted in Bangladesh have produced conflicting findings regarding the existence and nature of herding behavior. For example, studies such as Ahsan & Sarkar (2013) and Saha (2019) reported little or no evidence of herding behavior in the Dhaka Stock Exchange, whereas Khan & Imam (2023) and Islam (2022) identified significant herding tendencies under different market conditions. These inconsistencies may stem from differences in sample selection, methodological approaches, market proxies, and failure to adjust stock returns for dividends and rights issues.

Furthermore, most prior studies in Bangladesh focused on specific sectors, selected indices, or limited market conditions rather than the overall stock market. Existing

literature has also inadequately examined herding behavior across distinct market phases such as bull and bear markets, extreme market movements, crisis periods, and varying trading activity conditions within a unified framework. In particular, there is limited evidence regarding whether herding behavior intensifies differently during global crises compared to domestic crises in the context of Bangladesh.

In addition, the economic and regulatory environment of the Dhaka Stock Exchange differs substantially from developed and many emerging markets where the majority of herding studies have been conducted. Recent global and domestic economic events, including post-pandemic market conditions and periods of market instability, may have altered investor behavior patterns in Bangladesh. However, contemporary evidence capturing these changing dynamics remains scarce.

Therefore, this study seeks to bridge these gaps by comprehensively examining herding behavior in the Dhaka Stock Exchange using the CSAD model over a recent ten-year period under different market phases, crisis conditions, and trading activity scenarios.

Table 1: Summary of the Key Literature Review

Author	Findings	Methodology
Christie & Huang (1995)	First to use cross-sectional standard deviation to test herding behavior. Identified that herding behavior exists or occurs during large price movements and lower dispersion during extreme market movements.	Cross-Sectional Standard Deviation (CSSD) and OLS regression.
Chang, Cheng, & Khorana (2000)	The association between the dispersion of the return of the market portfolio and individual returns is non-linear and negative when herding behavior occurs.	"Cross-Sectional Absolute Deviation" (CSAD) and non-linear regression.
Lao & Singh (2011)	Herding behavior exists in both the Indian and Chinese markets. In the Chinese market, it can be observed in both market fall and high trading volume states, whereas in the Indian market, only upswing conditions exist.	The average CSAD model.
Khan & Imam (2023)	Herding behavior in Bangladesh's capital market exists and is more pronounced where trading activity increases.	Cross-sectional deviation (CSAD) model and conditional testing.
Islam (2022)	Confirmed the occurrence of herding behavior in the banking sector. Identified a more pronounced existence of herding behavior in the domestic financial crisis than in the global financial crisis. Herding behavior is more evident in the bull market phase, and investors in the banking sector avoid the crowd in the bear market phase.	Focused on the banking sector of Bangladesh only. Conducted the study following the cross-sectional standard deviation and "Cross-Sectional Absolute Deviation" approaches.

Table 1 (Contd.)

Author	Findings	Methodology
Kallinterakis & Lodetti (2009)	Market states like thin trading and illiquidity distort the dispersion of returns but do not result in herding.	Cross-sectional deviation (CSAD) model modified with thin trading characteristics.
Ahsan & Sarkar (2013)	Herding behavior is not a general market phenomenon in the Dhaka Stock Exchange (DSE).	Used the DSE all-share price index (DSI) to calculate market return and CSSD and CSAD models.
Saha (2019)	Found no herding behavior in the overall stock market.	Used only the DSE30 index stock for return data and the CSAD approach.
Komalasari et al. (2022)	Provided a structured knowledge of herding behavior, following over 80 papers and existing empirical studies on herding behavior in financial markets.	Followed a systematic literature review across 20+ years.

Source: Author's Compilation

2.2 Hypothesis Development

Based on the analysis of the literature, following are the hypotheses that this research has identified to test.

- **H_1:** There is significant herding behavior in the Dhaka Stock Exchange.
- **H_2:** Herding behavior exists and is intensified during the global crisis period (e.g., the COVID-19 Pandemic).
- **H_3:** Herding behavior exists and increases during the domestic crisis period (e.g., the July Uprising Movement).
- **H_4:** Herding behavior occurs in the bull market phase and is stronger during periods of extreme market returns rise.
- **H_5:** Herding behavior occurs in the bear market phase and is stronger during periods of extreme market return decline.
- **H_6:** Herding behavior is influenced by high market trading volume.
- **H_7:** Herding behavior is influenced by low market trading volume.
- **H_8:** Herding behavior is persistent over the period.

3. METHODOLOGY

3.1 Research Design

This is a quantitative study employing an econometric time-series empirical study. This uses numeric data such as the stock returns, trading volume, and CSAD. This data analysis does not include any first-hand data; rather, this is based on the published closing price data of the stock, dividend, and rights offering related information. Thus, the strategy is to do secondary or archival data analysis based on historical market data. For the analysis part, the methodological choice that has been used is a mono-qualitative method of research. Since it solely relied on the outcome of

numeric data from the regression and different tests. The time horizon followed for the data set construction and analysis is longitudinal. It accumulated daily closing price data of the stock for 10 years. The data set ranges from January 01, 2015, to December 30, 2024. The research techniques and procedures that have been used include the regression analysis.

3.2 Econometric Model(s)

The primary econometric or regression model of the study is the Chang, Cheng & Khorana (2000) "Cross-Sectional Absolute Deviation" (CSAD) linear regression model. It is based on the cross-sectional standard deviation (CSSD) model of Christie and Huang (1995). But the problem with this CSSD model is that it is less immune to outliers, and the result can be affected due to extremely large values or low values. CSAD, due to its consideration of absolute deviation it is more robust to extreme values such as outliers. Herding behavior can occur in both directions; thus, CSAD provides a more balanced outcome in both positive and negative directions.

3.2.1 Baseline Regression Model (General Herding)

The baseline model of the study represents normal market conditions.

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

Equation 1: CSAD Formula

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

Equation 2: Baseline Regression Model

Table 2: Baseline Model Variables

$CSAD_t$	Cross Sectional Absolute Deviation at time t;
α	Expected return dispersion when the market return is zero;
$R_{(i,t)}$	Stock return of individual firm i at time t;
$R_{(m,t)}$	Average return of the equally weighted portfolio at time t;
γ_1 and γ_2	The respective coefficients of the $R_{i,t}$ and $R_{m,t}$;
N	The number of stock in the portfolio;
ε_t	Unexplained variation or random noise.

Source: Author's Compilation

$CSAD_t$ does not directly report the herding phenomenon; rather, the association between realized $CSAD_t$ and $R_{(m,t)}$ together can report herding behavior. The coefficient of squared market return provided evidence of herding behavior. If γ_2 is negative, it reports there is herding; however, whether it is significant or not depends on the p-values. This will also be assessed for the normal trading days, excluding the market rising and market declining days for 1%, 5%, and 10% criteria. An equal-weight portfolio has been used to ensure balanced representation and avoid dominance of overall market behavior (Khan & Imam, 2023).

3.2.2 Crisis Period Models

This model aims to examine whether herding behavior exists or not, particularly during the global crisis period, i.e., the COVID-19 pandemic crisis period, and during the domestic crisis period, i.e., the July student-led movement period.

$$CSAD_t^{COVID\ (July)} = \alpha + \gamma_1^{COVID\ (July)} \mid R^{COVID\ (July)}_{m,t} \mid + \gamma_2^{COVID\ (July)} (R^{COVID\ (July)}_{m,t})^2 + \varepsilon_t$$

Equation 3: Global (Domestic) Crisis Period Regression Model

Table 3: Global (Domestic) Crisis Period Model Variables

$CSAD_t^{COVID\ (July)}$	Cross Sectional Absolute Deviation during COVID-19 pandemic (July) period t;
$\mid R^{COVID\ (July)}_{m,t} \mid$	Absolute market portfolio return during COVID-19 pandemic (July) period t;
$(R^{COVID\ (July)}_{m,t})^2$	Squared return of the equally weighted market portfolio during COVID-19 pandemic (July) period t;
$\gamma_1^{COVID\ (July)}$ and $\gamma_2^{COVID\ (July)}$	The respective coefficients of the $\mid R^{COVID\ (July)}_{m,t} \mid$ and $(R^{COVID\ (July)}_{m,t})^2$;

Source: Author's Compilation

The existence of negative and statistically significant γ_2^{COVID}. The coefficient would indicate that herding behavior occurs and is stronger during the global (domestic) crisis period in the Dhaka Stock Exchange. This should also be assessed before, during, and after the pandemic and the July uprising period.

3.2.3 Extreme Market Condition Models

3.2.3.1 Bull and Bear Market Model

This model aims to examine whether herding behavior exists or not, particularly in the increasing or bull market phase.

$$CSAD_t^{Bull(Bear)} = \alpha + \gamma_1^{Bull(Bear)} \mid R^{Bull(Bear)}_{m,t} \mid + \gamma_2^{Bull(Bear)} (R^{Bull(Bear)}_{m,t})^2 + \varepsilon_t$$

Equation 4: Bullish (Bearish) Market Condition Regression Model

Table 4: Bullish Market Condition Model Variables

$CSAD_t^{Bull(Bear)}$	Cross Sectional Absolute Deviation at time t when the market is rising (declining);
$\mid R^{Bull(Bear)}_{m,t} \mid$	Absolute market portfolio return at time t when the market is rising (declining);
$(R^{Bull(Bear)}_{m,t})^2$	Squared return of the equally weighted market portfolio at time t; when the market is rising (declining);
$\gamma_1^{Bull(Bear)}$ and $\gamma_2^{Bull(Bear)}$	The respective coefficients of the $\mid R^{Bull(Bear)}_{m,t} \mid$ and $(R^{Bull(Bear)}_{m,t})^2$;

Source: Author's Compilation

The presence of a negative and statistically significant coefficient $\gamma_2^{Bull(Bear)}$, would point out that herding occurs during the times of high price swings during upwards (downward) movements. This would reflect the result for the top (down) 1%, 5%, and 10% bull (bear) phases.

3.2.3.2 Tail Interaction Model

This model represents, during the rising (declining) market period, whether the investor behaves significantly differently, or not, compared to the normal market times. In other words, if herding behavior during the rising (declining) market phase is different compared to the regular market state.

$$CSAD_t^{Up(Down)} = \alpha + \gamma_1(\mid R_{m,t} \mid \times D_t^{Up(Down)}) + \gamma_2(R^2_{m,t} \times D_t^{Up(Down)}) + \varepsilon_t$$

Equation 5: Right or Upper Tail Interaction Regression Model

Table 5: Right or Upper Tail Interaction Model Variables

$CSAD_t^{Up(Down)}$	Cross Sectional Absolute Deviation at time t if market return is in extreme upper or right tail ;
$D_t^{Up(Down)}$	Dummy variable,when = 1, market return lies in extreme upper(down)or right(left)tail, otherwise zero;
$(\mid R_{m,t} \mid \times D_t^{Up(Down)})$	Absolute market portfolio return at time t that lies in the extreme upper or right tail;
$(R^2_{m,t} \times D_t^{Up(Down)})$	Squared return of the equally weighted market portfolio at time t that lies in the extreme upper (down) or right (left)tail;
γ_1 and γ_2	The respective coefficients of the $(\mid R_{m,t} \mid \times D_t^{Up(Down)})$ and $(R^2_{m,t} \times D_t^{Up(Down)})$;

Source: Author's Compilation

Unlike the period model (equation 8), this not only considers positive values but top (bottom) 1%, 5%, and 10% extreme price movements. The existence of a negative and statistically significant coefficient γ_2 would reflect that herding occurs in the times of high price swings in upturns (downturns) and is greater than in times of normal market conditions, where investors deem to accompany the market consensus or belief rather than their own belief, showing a non-linear association. This non-linear association gets captured by the coefficient γ_2.

3.2.4 Volume-Based Regression Models

This model aims to investigate whether herding behavior exists or not, particularly in the high (low) trading-volume market state.

$$CSAD_t^{High(Low)} = \alpha + \gamma_1^{High(Low)} \mid R^{High(Low)}_{m,t} \mid + \gamma_2^{High(Low)} \, (R^{High(Low)}_{m,t})^2 + \varepsilon_t$$

Equation 6: High (Low) Volume-Based Regression Model

Table 6: High Volume Based Model Variables

$CSAD_t^{High(Low)}$	Cross Sectional Absolute Deviation at time t when the market is in high (low) trading-volume state;
$\mid R^{High(Low)}_{m,t} \mid$	Absolute market portfolio return at time t when the market is in high (low) trading-volume state;
$(R^{High(Low)}_{m,t})^2$	Squared return of the equally weighted market portfolio at time t when the market is in high (low) trading-volume state;
$\gamma_1^{High(Low)}$ and $\gamma_2^{High(Low)}$	The respective coefficients of the $\mid R^{High(Low)}_{m,t} \mid$ and $(R^{High(Low)}_{m,t})^2$;

Source: Author's Compilation

The statistically significant coefficient $\gamma_2^{High(Low)}$ would indicate herding behavior occurs in times of high (low) market trading, where investors tend to follow the trading activities of market participants and tend to mimic them. This would be tested for the top (bottom) 10%, 20%, and 30% trading volume.

3.2.5 Lagged CSAD (Persistency) Regression Model

The motive of the lagged CSAD model is to test whether herding behavior is persistent over the period and whether today's herding depends on yesterday's herding or not.

$$CSAD_t = \alpha + \delta CSAD_{t-1} + \gamma_1 \mid R_{m,t} \mid + \gamma_2 R^2_{m,t} + \varepsilon_t$$

Equation 7: Lagged CSAD Regression Model

Table 7: Lagged CSAD (Persistency) Model Variables

$CSAD_t$	Cross Sectional Absolute Deviation at time t;
$CSAD_{t-1}$	One-day lag of CSAD;
$\mid R_{m,t} \mid$	Absolute market portfolio return at time t;
$R^2_{m,t}$	Squared return of the equally weighted market portfolio at time t;
δ, γ_1 and γ_2	The respective coefficients of the $CSAD_{t-1}$, $\mid R_{m,t} \mid$ and $R^2_{m,t}$

Source: Author's Compilation

Today's herding behavior over the period would be persistent; the coefficient of lagged CSAD δ is positive and statistically significant. This would inform that today's herding depends on yesterday's herding.

3.3 The Data Set

The study is conducted to test if herding behavior exists in the Dhaka Stock Exchange or not. Therefore, to present the overall data set, stocks listed on the Dhaka Stock Exchange were the main focus. However, there is also a large number of stocks listed on the Dhaka Stock Exchange. There are a total of 656 securities listed in the Dhaka Stock Exchange, of total 397 are listed companies, as of June 29, 2025. This only includes stocks of 326 companies that comprise its DSEX index. Closing price,

trading volume, cash dividend, stock dividend, right ratio, and right offering price were collected for 326 companies for the period January 01, 2015, to December 31, 2024. However, they were trimmed down and adjusted for non-trading and floor price days. Daily data was chosen to capture dynamic market conditions, crisis incidents, and normal periods.

4. ANALYSIS AND FINDINGS

4.1 Descriptive Analysis

The descriptive analysis provides an understanding of the key features of the data set through the use of historical data and provides a foundation for future analysis, e.g., predictive analysis. It includes the statistics of average market return, absolute return, return squared, cross-sectional absolute deviation (CSAD), average volume, and DSEX index.

Table 8: Descriptive Statistics

Particulars	Market Return	Absolute Return	Return Squared	CSAD	Average Volume	DESX
Unit	Fraction	Fraction	Fraction	Fraction	Numbers	Fraction
Mean	.0003214	.0069561	.0001074	.0157083	27587531100	0.0000227
Median	.0004888	.0048917	.0000239	.0153336	456957	0.000000
Max	.1428038	.1428038	.0203929	.0570877	10637448778753	0.979842
Min	-.0766822	0.000003	0.000000	.0014556	31249.43	-0.67371
Range	0.219486	0.1428008	0.0203929	0.0556321	10637448747504	1.653552
σ^2	0.000107	0.000059	0.000000	0.0000263	1.54798E+23	0.000065
σ	.0103623	.0076859	.0005009	.0051255	456956.6	0.0080604
Skewness	1.057492	4.542908	29.5341	.7484445	19.08872	.7136817
Kurtosis	22.63326	53.19664	1143.207	5.998819	421.8001	18.67273
N	2382	2382	2382	2382	2382	2382

Source: Authors' Compilation

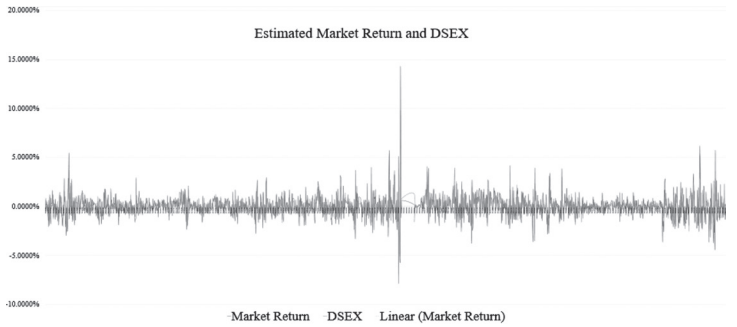
The mean and median of the market return of the equally weighted portfolio are very low. These are close to zero. It indicates that the average return investors receive in the Dhaka Stock Exchange is very low. It also indicates poor accomplishments of the stock market. However, if the maximum value is looked at, the value is high, which shows a maximum return of 14.28%. But the range is very high between the maximum return and minimum return, which is 21.94%. The measurements of dispersion, variance, and standard deviation are low. The skewness is close to one, showing it is positively skewed. However, the kurtosis shows it is a highly peaked distribution. The statistics of the absolute are not different from the mean market return since it is the absolute form of the market return. However, the skewness and kurtosis show the distribution is highly positively skewed and even more peaked than the mean market return. The squared market return holds the properties of the mean market

return. The cross-sectional absolute deviation shows that both the mean and median values are greater than the average market return. The maximum return is, however, less, and the minimum return has increased, showing a balance between maximum and minimum earnings. The skewness favors the normal positive shape, but kurtosis still shows the market return's tendency towards peakedness. The average volumes show a high difference between the minimum and maximum trading activity. The dispersion results are very high. Its distribution forms a highly positively peaked, skewed shape. The DSEX provides a description of the actual scenario. It shows that the market return of the equally weighted portfolio of this paper has been able to capture the actual market scenario very closely.

4.2 Graphical Analysis

4.2.1 Market Return and DSEX

This graph includes the data of the estimated average market return of the equally weighted portfolio constructed, and the data of the DSEX index itself. The purpose of this graph is to verify that the calculated average market return behaves similarly to the DSEX index return.

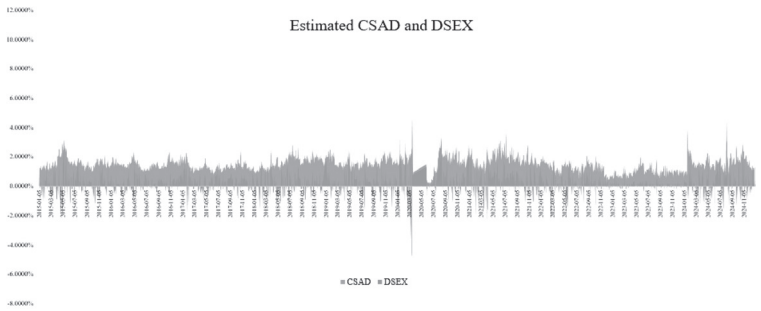


Graph 1: Estimated Market Return and DSEX Index Return from Jan 01, 2015 to Dec 31, 2024
Source 05: Authors' Compilation

From the graph, it can be observed that the two-return series are moving closely together. In some cases, the DSEX index return overlaps the estimated market return and vice versa. However, the major outlook from the graph is that these two-return series are moving closely together, and there is not much deviation. It validates the use of the average market return to examine the herding behavior as a proxy.

4.2.2 CSAD and DSEX

This graph includes the data of the estimated cross-sectional absolute deviation (CSAD and DSEX index return series for the same period, January 01, 2015, to December 31, 2024. The purpose is to examine whether the dispersion is high or low. If it is high, investors behave differently. Additionally, if the dispersion is low and one series merges with another with less dispersion, herding is present.



Graph 2: Estimated CSAD and DSEX Index Return from Jan 01, 2015 to Dec 31, 2024
Source: Authors' Compilation

In this graph, it can be seen that cross-sectional absolute deviation merges with the DSEX index return series. There are high dispersions in some periods, e.g., from April 2020 to June 2020, etc. The majority of the period two series are in place together with little dispersion. It indicates that investors are moving together with the market and changes with the market's performance. This provides evidence for herding behavior.

4.3 Diagnostic Model Output Analysis

4.3.1 Jarque-Bera Test

The Jarque-Bera test is conducted to assess if the data set follows a normal distribution or not. Earlier in the descriptive statistic segment, it was found that most of the variables do not follow a normal distribution and are positively skewed and highly peaked.

Table 9: Jarque-Bera Test

				---------- Joint ----------	
Variable	Observations	Pr (Skewness)	Pr (Kurtosis)	Adj chi2 (2)	Prob>chi2
market_ return	2382	0.0000	0.0000	.	0.0000
CSAD	2382	0.0000	0.0000	.	0.0000

Source: Authors' Compilation

Hypotheses of the Jarque-Bera Test:

Null Hypthesis (H_0): Residuals are normally distributed.

Alternative Hypthesis (H_1): Residuals are not normally distributed.

Decision Rule: Reject H_0 if $p<0.05$.

The probability value, *Prob>chi2*, for both the variables is 0.0000. For both cases, the value is less than 0.05. Thus, it has failed to accept the null hypothesis (H_0) and

accept the alternative hypothesis (H_1). Additionally, it concludes the residuals are not normally distributed rather skewed and peaked.

4.3.2 ADF Test

The Augmented Dickey-Fuller test is used for a unit root test. It tests whether the time series data is stationary, indicating that statistical properties such as mean and variance do not change over time. The test has been done for both the market return and CSAD.

Hypotheses of the ADF Test:

Null Hypthesis (H_0): Series has a unit root and non-stationary.

Alternative Hypthesis (H_1): Series is stationary.

Decision Rule: Reject H_0 if ADF Statistic<Critical Value or p<0.05.

This is the ADF test for market return series and CASD. This is tested for 1%, 5%, and 10% critical values.

Table 10: ADF Test for Market Return and CSAD

		---------- Interpolated Dickey-Fuller ----------			
		Test Statistic	**1% Critical Value**	**5% Critical Value**	**10% Critical Value**
Market Return	z(t)	-29.752	-3.430	-2.860	-2.570
	MacKinnon approximation p-value for z(t) = 0.0000				
CSAD	z(t)	-9.996	-3.430	-2.860	-2.570
	MacKinnon approximation p-value for z(t) = 0.0000				

Source: Authors' Compilation

The ADF statistic calculated for market return and CSAD are -29.752 and -9.996. At 1%, 5%, and 10% critical values, the ADF test statistic of market return is lower, (-29.752<-3.430<-2.860<-2.570), and CSAD is lower, (-9.996<-3.430<-2.860<-2.570). The p-value of both is 0.000, which is also lower than 0.05. Thus, at both the critical value and p-value measurements, it failed to accept the null hypothesis (H_0) and conclude that the dispersion, market return, and CSAD series are stationary.

4.4 Herding Behavior Measurement Regression Model Output Analysis

4.4.1 Baseline Herding Model

The baseline model is attached with no conditions of the market state; rather, it focuses on all the trading days. However, the 1%, 5% and 10% criteria present the normal days excluding the top and bottom 1%, 5%, and 10% positive and negative return or market rise and market decline data. Thus, providing evidence on normal market conditions. The following table presents the regression data. As mentioned in the methodology section $CSAD_t$ solely does not indicate herding behavior; rather, the

association between average $CSAD_t$ and $R_{m,t}$ Presents herding behavior through ex-post data. Therefore, to get evidence on herding behavior, the coefficient of squared market return needs to be negative and statistically significant.

Table 11: Herding Behavior Measurement in Normal Market Conditions

Particulars	Baseline CSAD	Normal Market 1% Criterion	Normal Market 5% Criterion	Normal Market 10% Criterion
γ_1	0.364***	0.523***	0.688***	0.729***
	(0.0181)	(0.0489)	(0.0799)	(0.123)
γ_2	**-0.900*** **	**-7.101*** **	**-19.73*** **	**-24.52** **
	(0.277)	(2.335)	(5.678)	(12.22)
α	0.0133***	0.0127***	0.0124***	0.0124***
	(0.000140)	(0.000188)	(0.000219)	(0.000248)
AR (1)	0.7093	0.7010	0.7311	0.7650
R^2	0.233	0.186	0.131	0.0989
Adjusted R^2	0.232	0.186	0.130	0.0979
N	2382	2336	2144	1906
F	361.42***	267.1***	161.2***	104.4***
Herding Behavior Presence	Yes	Yes	Yes	Yes
Significance	Yes (Strong)	Yes (Strong)	Yes (Strong)	Yes (Moderate)
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$				

Source: Authors' Compilation

Here γ_1 is the coefficient of absolute market return. It usually captures a linear association. It indicates that when market returns increase, CSAD also increases. Therefore, due to this positive association, dispersion also rises and provides no evidence of herding. The asterisks show it is strongly significant. However, we wish to capture the non-linear association. If investors follow the herd, it would show a non-linear association rather than a linear one. Thus, we consider the coefficient of the squared market return. γ_2. It presents a non-linear association between CSAD and market return at any time t. It asserts to the fact that when market returns increase, the cross-sectional absolute deviation (CSAD) decreases. Thus, the dispersion will reduce and show investors are moving in together rather than scattering their investments on their own. As a result, a negative association is preferable. In this base case or normal market conditions, the estimated coefficients γ_2, are negative and significant at 1% significance level. Therefore, the γ_2 coefficients here are statistically significant and propose occurrence of herding behavior occurs in the Dhaka Stock Exchange. This also invalidates the findings of Ahsan & Sarkar (2013). It can be concluded that herding behavior occurs in the Dhaka Stock Exchange, and this model shows strong autocorrelation and suggests herding may continue over the period.

4.4.2 Crisis Herding Behavior Models

Crisis herding models are indicating to the models that aim to capture different crises, i.e., global crises such as the COVID-19 pandemic and domestic crises such as the July student-led movement. Market crashes and crises can sometimes be seen as conditions that can not be assessed as normal market conditions. Thus, the impact on investor behavior is necessary to assess. Here COVID-19 pandemic is denoted as a global crisis, and the July student-led movement is denoted as a domestic crisis. The time period chosen for the global crisis is from December 01, 2019, to December 31, 2021. As for the July student-led movement, the political unrest situation in the chosen period is from July 01, 2024, to December 31, 2024.

Table 12: Herding Behavior Measurement in Crisis Period

Particulars	Baseline CSAD	Global Crisis	Domestic Crisis
γ_1, γ_1^{COVID}, & γ_1^{JULY}	0.364***	0.337***	-0.583***
	(0.0181)	(0.0399)	(0.258)
γ_2, γ_2^{COVID}, & γ_2^{JULY}	**-0.790***	**17.40*****	**-0.900*****
	(0.277)	(0.421)	(5.195)
α	0.0133***	0.0156***	0.0188***
	(0.000140)	(0.000383)	(0.00258)
AR (1)	0.7093	0.6445	0.4607
R^2	0.233	0.245	0.481
Adjusted R^2	0.232	0.242	0.424
N	2382	468	21
F	361.42***	75.50***	8.356***
Herding Behavior Presence	Yes	Yes	No
Significance	Yes (Strong)	Yes (Weak)	Yes (Strong)
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			

Source: Authors' Compilation

Here γ_1 The absolute market return coefficient captured the linear association, indicating the increase in CSAD with the increase in market return. The main focus is to observe a non-linear association, represented through the coefficient of squared market return. γ_2 which is negative and significant at 1% level. It accepts the hypothesis that herding occurs in the Dhaka Stock Exchange in the period of global crisis, where they tend to follow the market consensus due to high uncertainty in the market.

On the contrary, a different outcome can be observed in the case of a domestic crisis period. During the normal period, herding is strongly evident in the Dhaka Stock Exchange, but during the period of domestic crisis, it is absent. The result is contradictory since at the time of uncertainty, investors are deemed to be more cautious and become risk-averse (Miller, 1997); they do not follow the herd or

market consensus, but rather, take precautionary steps and follow their own beliefs and private information. Another conclusion can be drawn from the data. Investors in the Bangladesh stock market do not possess proper knowledge regarding investment and the stock market. Thus, they refrain from investing during the period of domestic crisis.

4.4.3 Extreme Market Condition Models

4.4.3.1 Herding Behavior Measurement in Bull Market

The bull market refers to a market that is on the rise, and the economic conditions are most of the time favorable. In favorable economic conditions, the price of the stocks increases; therefore, the return also goes up. The bull market here assessed is based on the criteria that include returns greater than zero ($R_{m,t} > 0$).

Table 13: Herding Behavior during Bull Market Conditions

Particulars	Bull ($R_{m,t} > 0$)	Bull 1%	Bull 5%	Bull 10%
γ_1^{Bull}	0.461***	0.0798	0.104	0.0466
	(0.0238)	(0.410)	(0.104)	(0.0830)
γ_2^{Bull}	**-1.450*** **	**1.276**	**1.119**	**1.453** **
	(0.304)	(2.232)	(0.711)	(0.634)
α	0.0133***	0.0196	0.0192***	0.0208***
	(0.000187)	(0.0145)	(0.00245)	(0.00161)
AR (1)	0.7586	--	0.7435	0.8382
R^2	0.325	0.770	0.511	0.304
Adjusted R^2	0.324	0.718	0.495	0.293
N	1264	12	63	126
F	303.7***	15.03***	31.38***	26.86***
Herding Behavior Presence	Yes	No	No	No
Significance	Yes (Strong)	No	No	Yes (Moderate)
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$				

Source: Authors' Compilation

The investors follow others at times of rise since the coefficient is negative and significant at 1% significance level. But different observations can be seen in the extreme rise. The top 1% return includes 12 observations, the top 5% includes 63 observations, and the top 10% includes 126 observations. Compared to the total data set, this is much less data. It implies that there are a few times when the Dhaka Stock Exchange has observed high returns. At the 10% criterion, the coefficient is statistically significant. However, it can not be used to infer a conclusion since it is positive. As mentioned earlier, a negative result or association is expected between average market return and cross-sectional absolute deviation (CSAD). To summarize, herding behavior occurs in times of market rise, where irrational investors may follow

the herd due to greed and inexperience. In case of extreme price swings, however, herding is not present in the Dhaka Stock Exchange.

4.4.3.2 Herding Behavior Measurement in Bear Market

The bear market refers to a market that is on the decline, and the economic conditions are generally unfavorable. In the unfavorable economic conditions, the price of the stocks decreases; therefore, the return also goes down (Maheu et al., 2012). The bear market here assessed is based on the criteria that include returns less than zero ($R_{m,t} < 0$).

Table 14: Herding Behavior Measurement in Bear Market

Particulars	Bear ($R_{m,t} < 0$)	Bear 1%	Bear 5%	Bear 10%
γ_1^{Bear}	0.316***	0.827***	0.910**	0.887
	(0.0338)	(0.217)	(0.369)	(1.617)
γ_2^{Bear}	**-2.069****	**-8.042*****	**-8.940****	**-9.094**
	(0.844)	(2.807)	(4.373)	(15.11)
α	0.0131***	0.00459	0.00304	0.00503
	(0.000216)	(0.00339)	(0.00660)	(0.0404)
AR (1)	0.6941	0.8642	-0.0651	0.4218
R^2	0.146	0.197	0.150	0.0621
Adjusted R^2	0.145	0.182	0.117	-0.172
N	1118	111	55	11
F	95.63***	13.27***	4.592**	0.265
Herding Behavior Presence	Yes	Yes	Yes	Yes
Significance	Yes (Moderate)	Yes (Strong)	Yes (Moderate)	No
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$				

Source: Authors' Compilation

The bottom 1% return includes 111 observations, the bottom 10% includes 55 observations, and the bottom 10% includes 11 observations. The coefficients of squared market returns (γ_2^{Bear}) are negative under all of the criteria, even though the significance levels are different. The asterisk in the overall bear market, bottom 1% and 5% returns show that they are significant at a 5%, 1%, and 5% significance level. On the contrary, the bottom 1% negative return conveys strong signals that there is herding in the bear market. At first, the coefficients are negative, and they are at 1% significance level strongly statistically significant. Thus, it can be said that during the period of uncertain conditions or declining economic conditions, when the stock prices decline, the return goes down, investors panic, and disregard their beliefs or private information. This relates to the evidence of Khan & Imam's (2023) findings. It concluded that uncertainty intensifies herding behavior, and this model provides evidence that during the period of market decline, uncertainty among the investors occurs, and herding behavior is also seen.

4.4.3.3 Herding Behavior During Extremely High and Low (Right and Left Tail) Market Returns

This high model presents the top extreme market returns. Unlike the previous bull market model, this does not only include returns that are more than zero. Rather, it includes all the return that lies or fall under the top right tail. In this way, it can include market boom and other favorable market events. Where the low market return includes all the return that lies or fall under the bottom left tail. In this way, it can include market busts, market crashes, and other unfavorable market events, e.g., sharp selloffs.

Table 15: Herding Behavior During Extremely High and Low (Right and Left Tail) Market Conditions

Particulars	Bull Extreme 1%	Bull Extreme 5%	Bull Extreme 10%	Bear Extreme 1%	Bear Extreme 5%	Bear Extreme 10%
γ_1	0.191***	0.254***	0.314***	0.137***	0.219***	0.465***
	(0.0516)	(0.0294)	(0.0243)	(0.0412)	(0.0539)	(0.118)
γ_2	**0.683**	**0.180**	**-0.333**	**0.351**	**-1.151**	**-5.227****
	(0.504)	(0.366)	(0.330)	(1.069)	(1.243)	(2.119)
α	0.0156***	0.0155***	0.0153***	0.0156***	0.0156***	0.0157***
	(0.000103)	(0.000102)	(0.000100)	(0.000106)	(0.000105)	(0.000104)
AR (1)	0.7306	0.7278	0.7275	0.7397	0.7396	0.7423
R^2	0.0481	0.0886	0.131	0.0234	0.0241	0.0160
Adjusted R^2	0.0473	0.0878	0.130	0.0226	0.0233	0.0152
N	2382	2382	2382	2382	2382	2382
F	60.09***	115.6***	179.5***	28.52***	29.36***	19.34***
Herding Behavior Presence	No	No	Yes	No	Yes	Yes
Significance	No	No	No	No	No	Yes (Moderate)
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$						

Source: Authors' Compilation

The purpose of this model is to test what happens when the stock price rises in the market compared to the situation in the normal market. It aims to test whether herding behavior intensifies during the market rise compared to the normal market condition, or reacts in the same way, or if fragmentation occurs. In the earlier bull model, it was concluded that herding does occur in the overall bull or rising market, which is a similar finding to the Khan & Imam (2023) paper. However, the coefficient of the squared market return (γ_2) are not negative in case of the top 1% and 5% right tail distribution. Additionally, neither of them is statistically significant. However, the top 10% right-tail distribution of return shows a negative coefficient, but it is not significant. Thus, it retains consistency with the models. It can be concluded that

herding behavior occurs in the bull market, but does not go up or intensify during an extreme stock market boom or rise in the Dhaka Stock Exchange.

Earlier in the bear market period, the conditional model inferred that herding behavior occurs during market decline or bear market phase in the Dhaka Stock Exchange. Additionally, it is not consistent with the findings of the latest published research paper on the Bangladesh stock market on herding behavior, Khan & Imam (2023) (as of July 29, 2025). More importantly, it is not consistent with the findings of this paper and supports the period bear market conditional model. However, the coefficient of the squared market return (γ_2) are negative only for both 10% left tail return distribution, and in the case of the bottom 1% left tail return distribution is positive, but in 5% tail, it is negative. The bottom 10% left-tail distribution of return shows a negative coefficient, and it shows moderate significance. Thus, it retains consistency with the model, the 10% bear market period model. Herding behavior occurs in the bear market or market decline, and it intensifies herding behavior during the extreme stock market bust or bear market phase in the Dhaka Stock Exchange, compared to normal market conditions.

4.4.4 Volume-Based Models

This would test whether herding behavior occurs during the times of high (low) market trading, investors follow the trading activities of market participants and tend to mimic them, or not. This has been tested for the top (bottom) 10%, 20%, and 30% trading volume.

Table 16: Herding Behavior Measurement in High (Low) Trading Volume

Particulars	High Volume 10%	High Volume 20%	High Volume 30%	Low Volume 10%	Low Volume 20%	Low Volume 30%
γ_1^{High}	0.515***	0.520***	0.455***	0.814***	0.707***	0.609***
	(0.136)	(0.0787)	(0.0507)	(0.0721)	(0.0541)	(0.0457)
γ_2^{High}	**-4.808**	**-6.673****	**-3.904****	**-6.394*****	**-7.643*****	**-5.868*****
	(5.456)	(2.866)	(1.547)	(2.139)	(1.509)	(1.327)
α	0.0159***	0.0153***	0.0151***	0.00684***	0.00883***	0.00996***
	(0.000676)	(0.000396)	(0.000296)	(0.000351)	(0.000296)	(0.000244)
AR (1)	0.4627	0.5581	0.5728	0.6449	0.7428	0.7716
R^2	0.189	0.201	0.203	0.579	0.427	0.374
Adjusted R^2	0.182	0.198	0.201	0.576	0.425	0.372
N	238	476	714	238	476	714
F	27.45***	59.64***	90.82***	161.8***	176.4***	212.0***
Herding Behavior Presence	Yes	Yes	Yes	Yes	Yes	Yes
Significance	No	Yes (Moderate)	Yes (Moderate)	Yes (Strong)	Yes (Strong)	Yes (Strong)
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$						

Source: Authors' Compilation

The coefficients of the squared return (γ_2^{High}) are negative under all the criteria. Additionally, the asterisks show, it is also moderately statistically significant for 20% and 30% high trading volumes. It manifests to the point that herding behavior occurs in the Dhaka Stock Exchange during times of high trading of stocks. This could occur due to the irrational investors who are inexperienced and mimic the behavior of the investors or the market. This reduces the dispersion in market consensus and results in herding behavior. It supports the finding of Lao & Singh (2011) of their Chinese market result. The coefficients of the squared return (γ_2^{Low}) negative values under each criterion are also strongly statistically significant under each criterion. It indicates that herding behavior occurs in the Dhaka Stock Exchange during times of low trading of stocks. This also could occur due to the presence of irrational investors and inexperienced investors who mimic the behavior of the investors or the market. Due to low trading activities, investors may rely on the market consensus and follow it to make their investment decision rather than on private information of their own belief. This evidence is contrary to the findings of Kallinterakis & Lodetti (2009) and findings on the Indian market by Lao & Singh (2011).

4.4.5 Test of Robustness

Robustness is a type of test that assesses and verifies the model's ability to detect and manage research findings when subject to unexpected inputs, errors, and extreme conditions without failing or crashing. It ensures that the model is reliable and provides confidence in concluding the results. The purpose of conducting this test is to identify whether the models of this paper remain consistent when they are subject to slight modification in parameter choices, assumptions, or samples. The test of robustness is to be done through the assessment of the persistent herding model, examination of returns in different sample sizes, and specific time period or event assessment.

4.4.5.1 Persistency of Herding Behavior

Herding behavior is found in the normal market model, and it is significant as well. Whether this is consistent or not would determine the persistence and consistency of the model.

Table 17: Persistence Measurement of Herding Behavior

Particulars	Baseline CSAD	Lagged CSAD
γ_1	0.364***	0.180***
	(0.0181)	(0.0144)
γ_2	**-0.900*** **	**0.178**
	(0.277)	(0.187)
δ		**0.660*** **
		(0.0139)
α	0.0133***	0.00362***
	(0.000140)	(0.000221)

Table 17 (Contd.)

Particulars	Baseline CSAD	Lagged CSAD
AR (1)	**0.7093**	**0.2819**
R^2	0.233	0.663
Adjusted R^2	0.232	0.662
N	2382	1807
F	361.42***	1182.00***
Herding Behavior Presence	Yes	Yes
Significance	Yes (Strong)	Yes (Strong)
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$		

Source: Authors' Compilation

The measurement AR (1) in the baseline mode is 0.3, showing that 70.93% of today's CSAD can be explained by yesterday's CSAD. It provides evidence on the reliance of today's herding on yesterday's. In this case, the coefficient δ is positive. Moreover, it is strongly statistically significant. The F-statistic is significantly high for this model, showing it is a superior model. Since there is serial correlation in the model, the lagged model provided a better model. The explanatory power, R^2, of the model has significantly increased. 66.29% variation in the cross-sectional absolute deviation (CSAD) can be explained by the average market return. The lagged CSAD model is better, suggesting that in the lagged period, herding behavior is consistent in the Dhaka Stock Exchange. Thus, the findings of the baseline model are consistent with it, and the baseline model is valid.

4.4.5.2 Before, Onset, and After COVID-19 Pandemic Scenario

To check what happened or changed before and during the COVID-19 Pandemic, a new model was developed, only with the market returns before the COVID-19 pandemic period. The selected period is January 01, 2015, to Nov 30, 2019. As for the COVID-19 pandemic period, the model is the same as the equation (3), and from January 01, 2022, to December 31, 2024, has been considered as after the COVID-19 pandemic period.

Table 18: Herding Behavior Before, Onset, and After the COVID-19 Pandemic

Particulars	Before COVID-19 Pandemic	Onset of the COVID-19 Pandemic	After COVID-19 Pandemic
γ_1	0.268***	0.337***	0.466***
	(0.0384)	(0.0399)	(0.0458)
γ_2	**0.882**	**-0.790***	**-2.807****
	(1.383)	(0.421)	(1.224)
α	0.0142***	0.0156***	0.0106***
	(0.000187)	(0.000383)	(0.000269)

Table 18 (Contd.)

Particulars	Before COVID-19 Pandemic	Onset of the COVID-19 Pandemic	After COVID-19 Pandemic
AR (1)	0.7210	0.6445	0.6795
R^2	0.177	0.245	0.307
Adjusted R^2	0.176	0.242	0.306
N	1192	468	723
F	128.0***	75.50***	159.8***
Herding Behavior Presence	No	Yes	Yes
Significance	No	Yes (Weak)	Yes (Moderate)
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			

Source: Authors' Compilation

Before the COVID-19 pandemic, herding behavior was not evident in the Dhaka Stock Exchange. The presence of the pandemic also introduced the presence of herding behavior. The coefficient γ_2 is negative and is statistically significant at a 10% significance level. After the COVID-19 pandemic period that herding is consistent. AR (1) is greater than 0.3, showing consistency of herding over time. Besides, after the pandemic period, the coefficient became statistically significant at 5% significance level.

4.4.5.3 Before, Onset, and After July Student-Led Movement Scenario

The before model has been developed considering the market return for the period January 01, 2015 to June 30, 2024; and from August 07, 2024 to December 31, 2024 as the after July Student-led movement period; as for the July crisis period, the model is as same as equation 03.

Table 19: Herding Behavior Before, Onset, and After July Student-Led Movement

Particulars	Before the July Student-Led Movement	Onset of July Student-Led Movement	After the July Student-Led Movement
γ_1	0.379***	-0.583**	0.206**
	(0.0189)	(0.258)	(0.103)
γ_2	**-1.014*** **	**17.40*** **	**0.740**
	(0.279)	(5.195)	(2.087)
α	0.0132***	0.0188***	0.0159***
	(0.000143)	(0.00258)	(0.000863)
AR (1)	0.7211	0.4607	0.4271
R^2	0.229	0.481	0.270
Adjusted R^2	0.229	0.424	0.255

Table 19 (Contd.)

Particulars	Before the July Student-Led Movement	Onset of July Student-Led Movement	After the July Student-Led Movement
N	2263	21	98
F	336.2***	8.356***	17.60***
Herding Behavior Presence	Yes	No	No
Significance	Yes (Strong)	Yes (Strong)	No
Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$			

Source: Authors' Compilation

Herding behavior existed till the date a domestic political unrest situation occurred. During this period, herding behavior showed no evidence. According to market data, the DSEX index fell to 5333 BDT at the end of July 2024 from 5497 BDT. Besides, the stock market faced many changes during this period. This could cause panic among the individual investors who refrained from the stock market during the period of this domestic crisis. Besides, the coefficient remained positive and became insignificant after the government regime change in the country. This could be the reason for increased panic due to the structural changes in the market and stock exchanges.

6. DISCUSSION

The models have been run to test the association between average market return and cross-sectional absolute deviation (CSAD) to draw conclusions. The primary criterion is that the coefficient of squared return has to be negative and statistically significant, except for the lagged CSAD model, where the tested coefficient was $\boldsymbol{\delta}$ and required to be positive and significant to show consistency over the period. This study has examined herding behavior in the Dhaka Stock Exchange using Chang, Cheng & Khorana (2000) CSAD model. The analysis has identified that herding behavior exists in the Dhaka Stock Exchange. It has also been found that there is significant herding behavior in the Dhaka Stock Exchange during times of global crisis, and herding behavior significantly intensifies during the global crisis period compared to regular times. However, there is no significant herding behavior in the Dhaka Stock Exchange during times of domestic crisis, and herding behavior does not intensify during the domestic crisis period compared to regular times. There is also no significant herding behavior in the Dhaka Stock Exchange during the market rise or bull phase, and herding behavior does not intensify during the bull phase compared to the normal market. But there is significant herding behavior in the Dhaka Stock Exchange during market decline or bear phase, and herding behavior does intensify during the extreme bottom (1%) bear phase compared to regular times. There is also significant herding behavior in the Dhaka Stock Exchange during high and low trading activity. Besides, herding behavior is persistent over the period, and today's herding depends on yesterday's herding.

Table 20: Summary Table

H_0	Rejected	The alternative hypothesis is accepted.
H_1	Not Rejected	Herding behavior exists in the Dhaka Stock Exchange.
H_2	Not Rejected	Herding behavior occurs and intensifies during a global crisis.
H_3	Rejected	Herding behavior does not occur and is intensified during a domestic crisis.
H_4	Rejected	Herding behavior occurs but does not intensify during the bull phase.
H_5	Not Rejected	Herding behavior occurs and intensifies during the bear phase.
H_6	Not Rejected	Herding behavior occurs during high trading times.
H_7	Not Rejected	Herding behavior occurs during low trading times.
H_8	Not Rejected	Today's herding behavior depends on yesterday's herding.

7. CONCLUSION

Drawing on the results of this study, a range of policy recommendations can be advanced to enhance the efficiency and stability of the Dhaka Stock Exchange. Regulatory authorities, especially the Bangladesh Securities and Exchange Commission, are advised to strengthen market transparency, ensure the timely dissemination of information, and reduce information asymmetry to mitigate irrational, herd-driven trading behaviors. Expanding investor education and financial literacy initiatives is crucial for encouraging rational investment decisions and increasing awareness of behavioral biases. Given that herding behavior tends to intensify during global crises and periods of pronounced market downturns, regulators should reinforce market surveillance systems, implement effective early warning mechanisms, and bolster stabilization measures—such as circuit breakers—during episodes of excessive volatility. Furthermore, policymakers should foster increased participation by institutional investors, deepen market liquidity, and develop crisis-responsive regulatory interventions to curb speculative activity and improve overall market confidence and efficiency within Bangladesh's capital market.

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