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Analysing Investor's Herding Behavior through CSSD and CSAD Approach – A Bibliometric Study

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Abstract
This bibliometric study investigates the evolution of Cross-Sectional Standard Deviation (CSSD) and Cross-Sectional Absolute Deviation (CSAD) Models. It emphasizes their application in analyzing herding behavior in financial markets. The research has drawn on 64 Scopus-indexed articles published between 2009-2024; the research examined thematic trends, author productivity, and methodological advancements in the study of herding behavior. Advanced bibliometric tools such as Biblioshiny and VOSviewer are applied to explore author collaborations and thematic clusters. The result highlights the impact of technological advancements, global crises like COVID-19, the Russia-Ukraine War, the Israel-Hamas crisis, and the increasing influence of social media on joint investment behavior. Critical gaps, including herding in the unexplored asset class and its inferences in developing economies, are highlighted as probable areas for future research. The findings offer insight for investors, policymakers, and professionals to mitigate the influence of herd behavior on the financial market.

Keywords: Herding behavior, CSSD (Cross-Sectional Standard Deviation), CSAD (Cross-Sectional Absolute Deviation), Bibliometric analysis.

Introduction-
The study of investor behavior has garnered the attention of researchers, especially herding behavior. It is marked as an individual's tendency to follow other's actions (Sachdeva et al., 2021). Such acts of investors seem irrational while investing. Investors rely on the other's instead of assessing risk themselves (Baker et al., 2019; Youssef & Waked, 2022). Herding or herd behavior has played a vital role in shaping financial markets for a long time. Evidence shows that investors lose their confidence in their judgement during uncertainty. The tendency of investors to follow such behavior may result in share price distortion and increased volatility. Numerous events, such as COVID-19 pandemic, has demonstrated the occurrence of herding behavior (Youssef & Waked, 2022), Dot-com bubble 1999-2001 (Yafouz & Yet, 2023), Cryptocurrency Speculative Bubble (Haykir & Yagli, 2022), and Russia-Ukraine War (Mohamad, 2024; Zhang & Giouvris, 2023).

Although researchers employed several methodologies to trace herd behavior, still Cross-Sectional Standard Deviation (CSSD) by Christie & Huang (1995) and Cross-Sectional

Absolute Deviation (CSAD) by Chiang & Zheng (2010) were employed frequently by the researchers. The CSSD and CSAD are applied to stocks, commodities, and cryptocurrency market data. The same Models are found pragmatic to financial market data of developed countries like the USA and Europe and developed countries like India, Pakistan, and Malaysia. The research articles included in the study focus on the market conditions, particularly bull and bear markets. Moreover, these studies have examined the efficiency of financial markets by exploring the herd behavior of investors. This research article will highlight how the literature on herd behavior has evolved using CSSD and CSAD Models and research trends of the event-study methodology of investigating herd behavior. The research also attempts to explore the opportunities for future research.

Furthermore, it is the right time to acknowledge the Investor's bias, as the world is witnessing the fourth industrial revolution. The blend of IT and AI technologies is bombarding information on investors. Moreover, to understand whether investors use their nous to make decisions, explore the effect of behavioral outliers on investment decisions. This research will help policymakers and investors to adapt their strategies according to the dynamic market. Apart from the technological advancement, post-COVID-19 investors are attracted to the stock market. Investors see the stock market as a second source of earnings. Increased participation in the stock market has increased the chances of price volatility.

Our review article aims to answer the following research questions (RQ)-
RQ1- Evolution of CSSD and CSAD approaches to study the herd behavior.
RQ2- Different theoretical viewpoints applied in the herd behavior literature?
RQ3- Research methods included utilized in herd behavior along with CSSD and CSAD.
RQ4- What are future research possibilities for herd behavior using the CSSD and CSAD approach?

The review further aims to enhance the understanding of the topic proposing the future direction of research. The research paper is organised as follows- it begins with the background and definition of investor's herding, followed by the methodology and bibliometric analysis. The research further concludes by contributing the proposed avenues for future research on herd behavior utilising CSSD and CSAD approach.

Background of Investor's herding-

Herd is a spontaneous and irrational behavior. An individual follows an analyst's recommendation while suppressing their self-assessment (Christie & Huang, 1995). Pompian (2006) claimed that cognitive dissonance drives herd behavior. Investors neglect and counter the earlier information. Regret aversion bias also instigates herd behavior. Investors prefer to follow others over their assessment of investment due to their fear of failure, and following others has become a natural choice for them. BenSaïda (2014) defined herding behavior as intentionally imitating other investors' decisions to protect one's interest. This imitation can be rational or irrational. Social influence, informational factors, uncertainty, risk aversion, market efficiency violation, and liquidity are responsible for herding in the financial market.

The concepts of market efficiency and herding behavior are related to each other. The presence of one implies the absence of another. The Efficient Market Hypothesis (EMH) presumes that in an efficient market, investors make informed decisions, and security prices reflect all available information, making securities fairly priced (Purba & Faradynawati,

2012). The efficient market hypothesis (EMH) relies on the rationality of investors using market information when making decisions (Ah Mand & Sifat, 2021a). Herding behavior contradicts the efficient market hypothesis (EMH). When herding, investors mimic the actions of a crowd, disregarding their own judgment. It leads to the mispricing of securities and speculative bubbles, resulting in an inefficient market (Kanojia et al., 2022). Herding can create market anomalies that EMH cannot explain. Market bubbles, stock market crashes, and financial instability result from herding behavior. Eurozone crisis, Global Financial Crisis, and subprime crises are amplification and prolongation of herding behavior (BenSaïda, 2014). Several other examples of financial crises resulting from herding behavior are the Dutch tulip bulb mania, the Japanese asset bubble, the financial crisis of 2008, the dot-com bubble of 2001, the Rupiah depreciation from July 1997- to June 1998, and the Karachi Stock Exchange collapse in 2008 (Kashif et al., 2019). Fear, greed, and overreaction to the bad news influence investors' reactions to extreme market conditions.

Scholars have employed numerous statistical techniques to discover marks of herding. CSSD and CSAD are some of the widely applied techniques to investigate herd behavior in historical data of financial markets due to their robustness and simplicity of detecting the inefficiency of the financial market. The Cross-Sectional Standard Deviation (CSSD) (Chiang & Zheng, 2010) detects herding by examining the dispersion of stock market returns concerning the market average. It posits that in normal market conditions, dispersion between the stock and market return remains higher. However, during extreme market movements, the dispersion between the two reduces further reduction in CSSD values. This Model is widely used to incorporate different market conditions and control for extraneous factors (Adem & Sarıoğlu, 2020; Chiang et al., 2010). However, this model has some criticisms, including its subjective cut-off points for defining "extreme" market movements and its linearity assumptions (Kashif et al., 2019).

On the other hand, the Cross-Sectional Absolute Deviation (CSAD) Chiang & Zheng, (2010) this Model addresses the limitations of the CSSD Model (Kashif et al., 2019; Tessaromatis & Thomas, 2009). Like CSSD, in extreme market conditions, the market and stock return deviate less in comparison to the normal market conditions (Khoshsirat & Salari, 2011; ADEM, 2020; Kiran et al., 2020; Akbar et al., 2019; Amirat & Alwafi, 2020; Chiang et al., 2010; Prosad et al., 2012).

Table 1 List of Influential research papers on herd behavior

Influential Research Papers on the herd behavior	Reference
Do investors herd in emerging stock markets?: Evidence from the Taiwanese market	Demirer et al., 2010
Herding in the cryptocurrency market: CSSD and CSAD approaches	Vidal-Tomás et al., 2019
Herding behavior and contagion in the cryptocurrency market	da Gama Silva et al., 2019
Herding behavior, market sentiment and volatility: Will the bubble resume?	Bekiros et al., 2017
Does herding behavior exist in the Mongolian stock market?	Batmunkh et al., 2020
Investor Sentiment and Herding Behavior in the Korean Stock Market	Choi & Yoon, 2020

HERDING IN CRYPTO-CURRENCY MARKETS	Ajaz & Kumar, 2018
Empirical investigation of herding in cryptocurrency market under different market regimes	Kumar, 2020
Herd behavior in the French stock market	Litimi, 2017
What Drives Herding Behavior in the Cryptocurrency Market?	Youssef, 2022
On the effect of herding behavior on dependence structure between stock markets: Evidence from GCC countries	Youssef & Mokni, 2018
Did Investors Herd during the Financial Crisis? Evidence from the US Financial Industry	Humayun Kabir, 2018
The dynamic and asymmetric herding behavior of US equity fund managers in the stock market	Fang et al., 2017
Good vibes only: The crypto-optimistic behavior	Caferra, 2020
Investor's herding behavior in Asian equity markets during COVID-19 period	Jiang et al., 2022

Source: Author's compilation with the help of Scopus database.

Table 1 shows the frequently cited research on herd behavior using CSSD and CSAD techniques. Among several impactful studies, two worthy studies were conducted by Demirer et al. (2010) and Bekiros et al. (2017), investigating the herd behavior and efficiency of the Taiwanese stock market. The research posits that market efficiency is not permanent. It has been observed that investors tend to act more rationally during an upward trend, while during a downfall, investors exhibit biased behavior. Choi & Yoon (2020), in their research on the Korean market, determined that during market volatility, investors experience an emotional swing that leads to herd behavior. da Gama Silva et al. (2019) suggested that herd behavior is not permanent for the bull and bear market. Batmunkh et al. (2020) perceive herd behavior as a global scenario. Developed markets witness the same informational inefficiency as developing ones.

Bibliometric Research method

The research focuses on the peer-reviewed articles indexed in the Scopus database, a widely preferred source for bibliometric research (Abdulrasool & Othman, 2020; Donthu et al., 2021; García-Corral et al., 2022; Jain et al., 2021). Initially, 1,198 research papers were extracted using keywords such as "herd," "CSSD," and "CSAD" within titles, abstracts, and keywords. After filtering articles in English and relevant fields (economics, finance, behavioral finance), 64 studies were selected for the study. The authors restricted their focus to the article on herd behavior; the articles must use statistical tools, i.e., CSSD and CSAD. In filtering the research articles, we concentrated on the subject area, i.e., economics, econometrics, Finance, Business management and accounting, psychology, social science, and multidisciplinary. The authors filtered keywords for the study, including- Herding behavior, herding, COVID-19, CSAD, Herd behavior, Behavioural finance, Cross-Sectional absolute deviation, and cryptocurrency. This research considered only articles published in English.

Analysis

The study examines the productivity and impact of authors, sources, and documents; the theories used; and bibliographic coupling for uncovering the important themes and conceptual coverage.

Table 2- The overview of the study

Description	Timespan	Sources (Journal)	Documents	Annual Growth Rate %	Average citations per doc	References	Keywords
Results	2009:2024	46	64	19.79	15.83	2839	21

Source: Scopus Database

Performance analysis

Table 2 presents the scope of the research. The research comprises 64 studies conducted during 2009-2024 from 46 Journals. The significance of research exists in the average citation of research papers, i.e., 15.83 per research paper. Fig. 1 demonstrates the surge in research interest in herd behavior using CSSD and CSAD methods starting in 2020. Since 2017, the researcher's interest has picked momentum in this field. In 2024 publications in the area reached an all-time high of 15 in a year. Table 3 ranks journals based on productivity and citation, identifying Review of Behavioral Finance and Journal of Behavioral and Experimental Finance emerging as leading sources in the field, according to Bradford's law of scattering (1934). The Zone 1 research articles are the group of widely cited and relevant articles. The journals are ranked based on their productivity: Review of Behavioral Finance (n= 6, 44 citations, h-index 2), Journal of Behavioral and Experimental Finance (n= 5, 201 citations, h-index 5), International Journal of Finance and Economics (n= 3, 9 citations, h-index 2), North American Journal of Economics and Finance (n= 3, 104 citations, h-index 3). Table 4 expresses the most influential researchers in the field. Demirer, R., Kutan, A. M., & Chen, C. D. (Demirer et al., 2010a) are the most influential researchers, with 354 citations and an average of 17.6 per year. Vidal-Tomás, D., Ibáñez, A. M., & Farinós, J. E. (Vidal-Tomás et al., 2019a) have authored prominent research that got 244 citations, an average of 48.8 per year. Thirdly, Herd behavior and contagion in the cryptocurrency market (da Gama Silva et al., 2019a) received 233 citations, an average of 46.6 citations yearly. Herding behavior, market sentiment, and volatility: Will the bubble resume? (Bekiros et al., 2017) got 164 citations and an average of 23.42 citations per year.

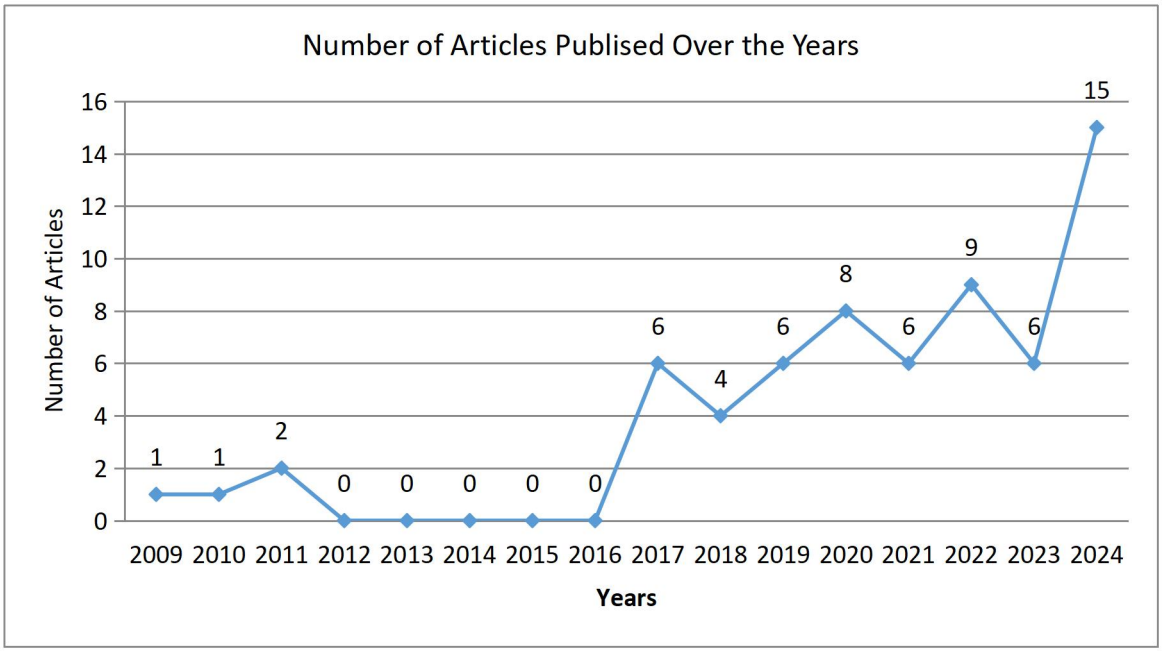

Figure 1-Growth of Publication
Source: Scopus Database

Table 3- Core sources of the field

Source	Rank	Freq	Zone	H Index	TC
Review of Behavioral Finance	1	6	1	2	44
Journal of Behavioral and Experimental Finance	2	5	1	5	201
International Journal of Finance and Economics	3	3	1	2	9
North American Journal of Economics and Finance	4	3	1	3	104
Global Business and Economics Review	6	2	1	18	2
International Journal of Financial Studies	7	2	1	30	2

Source: Author's compilation

Table 4- Most influential Author

Paper	DOI	Total Citations	TC per Year
DEMIRER R, 2010, J ECON BEHAV ORGAN	10.1016/j.jebo.2010.06.013	352	17.60
VIDAL-TOMÁS D, 2019, FINAN RES LETT	10.1016/j.frl.2018.09.008	244	48.80
DA GAMA SILVA PVJ, 2019, J BEHAV EXP FINANC	10.1016/j.jbef.2019.01.006	233	46.60
BEKIROS S, 2017, NORTH AM J ECON FINANC	10.1016/j.najef.2017.07.005	164	23.42
BATMUNKH M-U, 2020, PAC BASIN FINANC J	10.1016/j.pacfin.2020.101352	37	7.40
CHOI K-H, 2020, INTERN J FINANCIAL STUD	10.3390/ijfs8020034	31	6.20

AJAZ T, 2018, ANN FINANCIAL ECON	10.1142/S2010495218500069	30	4.29
KUMAR A, 2020, REV BEHAV FINANC	10.1108/RBF-01-2020-0014	29	5.80
LITIMI H, 2017, REV ACCOUNTFINANC	10.1108/RAF-11-2016-0188	29	3.63
YOUSSEF M, 2022, J BEHAV FINANC	10.1080/15427560.2020.1867142	26	8.67

Source: Author's compilation

Keyword Analysis-

Fig. 2 shows the two clusters of keyword co-occurrence. Cluster 1 comprises COVID-19, Cross-Sectional Absolute Deviation, CSAD, and herding behavior. Cluster 2 contains behavioral finance, herd behavior, and herding. Fig. 2 is connected to Fig. 1; Fig. 1 proves that in 2020, research interest in the field gained momentum. The same is visible in the trend of keyword selection. On the other hand, CSSD, and its advanced version, CSAD are being used in the studies to explore the presence of herding behavior, which also covered in all studies. Other keywords are- cryptocurrencies, stock market, market efficiency, behavior finance, investor sentiments, bitcoin, and CAPM.

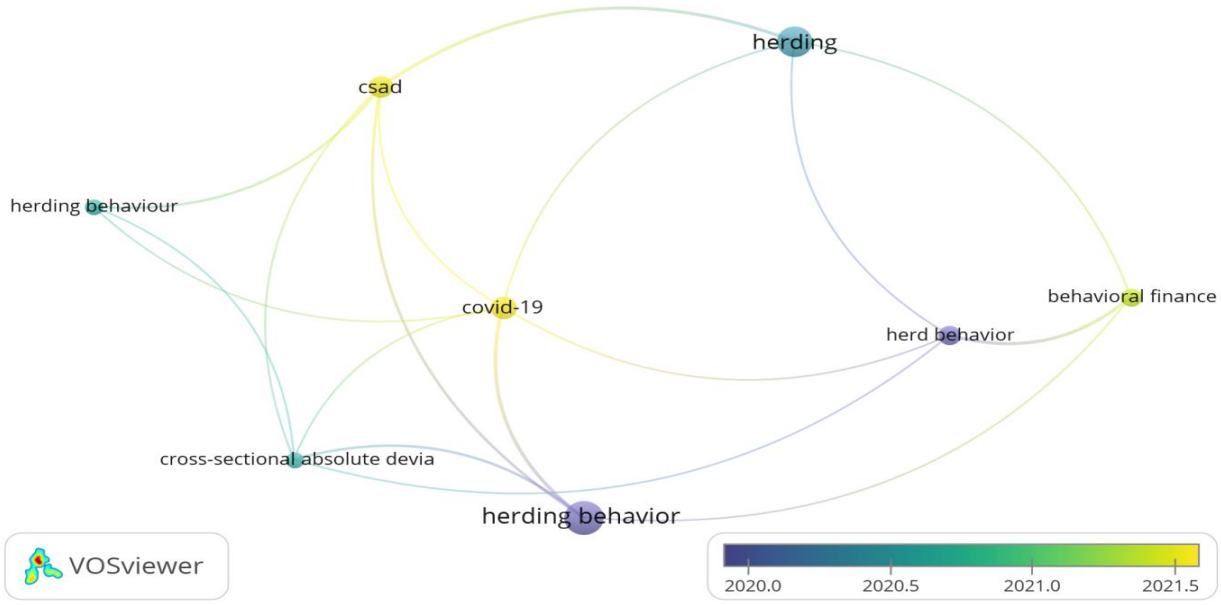

Figure 2- Author's Keyword

Source: Author's compilation through Scopus database

Thematic analysis

The Scopus database has been divided into several clusters. These clusters are various themes.

Cluster-1 Herd behavior in different stock markets

This cluster considers 20 publications on herd behavior in different stock markets. Under this theme, researchers attempted to trace the herd behavior in the different stock markets.

Athens Stock Exchange was selected for the study (Tessaromatis & Thomas, 2009), Taiwan (Demirer et al., 2010b), Iran (Araghi et al., 2011), Johannesburg Stock Exchange, South Africa (Ababio & Mwamba, 2017), France (Litimi, 2017), Pakistan (Akbar et al., 2019), Pakistan (Ahmed & Karira, 2019), Indonesia (Rizal & Damayanti, 2019), Pakistan (Kiran et al., 2020), Korea (Choi & Yoon, 2020), Mangolia (Batmunkh et al., 2020), Pakistan (Kashif et al., 2021), China (Kim et al., 2021), India (Naina & Gupta, 2022), China (Maquieira & Espinosa-Méndez, 2022), Saudi Arabia (Gabbori et al., 2022), India (Dhuri & Patkar, 2024), India (Pandey & Singh, 2024), Brazil (Carvalho et al., 2024) and ASEAN (Engkuchik et al., 2024). The earlier studies focused on the developed countries. In 2019 researchers concentrated their research on developing economies. Although herd behavior was not evident in all countries or stock markets, all studies contributed significantly to the literature on herd behavior.

Cluster-2 Herd behavior in the cryptocurrency market

Besides the stock markets, researchers also attempted to find traces of herd behavior in the cryptocurrency market. Scopus database contains seven research papers that studied herd behavior using CSSD and CSAD approach (Abou Tanos & Meharzi, 2024; Bogdan et al., 2023; Youssef, 2022; Caferra, 2020b; Kumar, 2020b; da Gama Silva et al., 2019b; Ajaz & Kumar, 2018). These studies not only show the possibility of studying in a field apart from stocks but also the possibilities of future research in the cryptocurrency market.

Cluster-3 Effect of global crisis (COVID-19) on herd behavior

The CSSD and CSAD approach to analyzing herd behavior attracted researchers during COVID-19. Bekiros et al. (2017) endeavored to trace the intensity of herd behavior during the global financial crisis. Herd behavior was observed at the beginning of the crisis, but its intensity was reduced by the end. Luu & Luong (2020) examined the herd behavior in the stock markets of Vietnam and Taiwan during the COVID-19 pandemic.

Abdeldayem & Al Dulaimi (2020), in the study of the Gulf Corporation Council (GCC), Karnatak & Malik (2021) in India, and Yagli et al., (2022) in the European stock market, concluded that uncertainty during the pandemic affected the herding behavior in the stock market. The inefficiency of the stock market maximizes the chances of herd behavior. Jiang et al. (2022b) analyzed the herd behavior in Singapore, Taiwan, Hong Kong, China, Japan, and South Korea during the COVID-19 pandemic. Herd behavior is apparent in the healthcare, tourism, and hospitality sectors of Asian countries. Maquieira & Espinosa-Méndez, (2022) concentrated on the period of COVID-19. The researchers found strong evidence of herd behavior in late December 2019, when global unrest was started. Nguyen et al., (2023) denoted that Vietnamese investors in the stock market react as per the impact in the Singapore stock market. Alexakis et al. (2023) analysis did not find herd behavior in the stock market. Nouri-Goushki & Hojaji, (2023) studied herd behavior in the Iranian stock market. Besides the COVID-19 pandemic, Iran has faced oil sanctions, a deficit budget and political turmoil as a negative shock. This negative environment fuelled the herd behavior in the Iranian stock market. Ghorbel et al., (2023) state that deaths during COVID-19 have stimulated herd behavior. The researchers analyzed herd behavior in the BRICS countries. Pandey & Singh (2024) also confirmed that herd behavior in the Indian stock market prevailed during the first and third waves of COVID-19.

Cluster-4 Herd behavior in commodity markets and Foreign Exchange Market

Although numerous studies exist on herd behavior using the CSSD and CSAD approach, there is a dearth of studies in the commodity market. A study by Zhang & Giouvris (2023) covers 15 years. The herd effect on the oil and gas market in BRICS countries is minimal even during the global crisis. During the non-crisis period, volatility in the oil and gas market increases. The Indian market was badly affected by herd behavior. Danila & Aggarwal (2024) studied the foreign Exchange Market in ASEAN countries such as the oil and gas market. Due to macroeconomic factors, researchers found an absence of herding in the Forex market.

Cluster-5 Herd Behavior and IPOs

Identical to the commodity market, a limited number of research studies are available herd behavior using CSSD and CSAD, focusing on the IPO market. Kim et al. (2021) considered the Chinese market during IPO listing. An inference has been drawn that the excitement rush while a new listing is in the market leads to herd behavior. It can lead to major price distortion and instability in the early IPO trading stage.

Cluster-6 Macro-economic events and herd behavior (Russia-Ukraine war)

Geopolitical turmoil, such as the Russia-Ukrain war and the Israel-Hamas War, disturbing financial markets worldwide. Zhang & Giouvris (2023) mentioned the Russia-Ukraine war. The war suddenly affected the supply chain mode of oil and gas, further triggering global price volatility. In the BRICS countries, every commodity market acted distinctly. Mohamad (2024) presented a comparative study on herd behavior during the Russia-Ukrain war and COVID-19. Herd behavior is affected more extensively by COVID-19 than by the Russia-Ukraine war.

Cluster-7 IT and Herd behavior (Google search and herd, Artificial Intelligence and herd)

Artificial Intelligence (AI) assist investors in selecting investment options. Herd behavior is visible during the upward movement in the stock market when the market is less volatile (Xiaoyang et al., 2024).

RQ1 Evolution of CSSD and CSAD approach

Cross-Sectional Standard Deviation (CSSD) and Cross-Sectional Absolute Deviation (CSAD) approaches use dispersion to detect herd behavior in the financial market (Ayhan Kapusuzoglu, 2011; Bogdan et al., 2022). Both methods are based on the notion that in normal market conditions, the return will deviate from the overall market return, but in the case of herding, the individual returns go in the same direction as the market return (Ahsan & Sarkar, 2013; Prosad et al., 2012).

Christie & Huang (1995) introduced the CSSD approach, measuring the average closeness of assets return to the realized market return (Ayhan Kapusuzoglu, 2011; Demirer et al., 2010b; Tessaromatis & Thomas, 2009). The CSSD is calculated as a square root of the average squared difference between stock return and the market return (Afrin, 2024; Ayhan Kapusuzoglu, 2011; Bharti & Kumar, 2022; Bogdan et al., 2022; Jiang et al., 2022b; Patel, 2023).

$$CSSD = \left(\frac{1}{N}\sum_{i=1}^{N}(R_{it} - R_{mt})^2\right)^{1/2}$$ (Afrin, 2024; Bogdan et al., 2022; Patel, 2023) Eq-1

R_{it} stands for the individual stock i at time t, while R_{mt} is the market return m at the time t. (Ahsan & Sarkar, 2013; Christie & Huang 1995; Prosad et al., 2012). Christie & Huang, (1995) added that during market anomalies, investors tend to overpower their own beliefs and follow the market consent, which could cause the CSSD to decrease (Ahsan & Sarkar, 2013; Bharti & Kumar, 2022; Purba & Faradynawati, 2012). They added that CSSD measures were only applicable during market unrest (BenSaïda, 2014).

Chang et al., (2000) proposed Cross Sectional Absolute Deviation (CSAD) as an alternative approach of CSSD (Ahsan & Sarkar, 2013; Ayhan Kapusuzoglu, 2011; Belhoula & Naoui, 2011; BenSaïda, 2014; Bogdan et al., 2022; Chiang et al., 2010; da Gama Silva et al., 2019b; Mintzberg et al., 1976; ÖZSU, 2015; Purba & Faradynawati, 2012; Tessaromatis & Thomas, 2009; Vidal-Tomás et al., 2019b; Zafar & Hassan, 2016). The CSAD calculate average of absolute difference between return of individual stock and market (Afrin, 2024; Ayhan Kapusuzoglu, 2011; Chiang et al., 2010; Dhuri & Patkar, 2024; Kiran et al., 2020; Liu & Guan, 2006; Mushinada & Veluri, 2020; Tessaromatis & Thomas, 2009; Vidal-Tomás et al., 2019b).

$CSAD = \frac{1}{N}\sum_{i=1}^{N} \left| r_{i,t} - r_{m,t} \right|$ (Bogdan et al., 2022; Liu & Guan, 2006; Maquieira & Espinosa-Méndez, 2022; Mushinada & Veluri, 2020; Patel, 2023; Vidal-Tomás et al., 2019b). Eq-2
Here, $r_{i,t}$ is return r of stock i return for time t and $r_{m,t}$ is return r of market m at time t (Kiran et al., 2020; Patel, 2023; Vidal-Tomás et al., 2019b).

RQ2. Theoretical Perspective of Herd Behavior
Herd behavior literature uses irrational and rational perspectives to explain why investors replicate others' actions (Ayhan Kapusuzoglu, 2011).

Rational Perspectives:
Externalities and Payoff Models: Investors may choose to follow others if it increases their payoff. This Model suggests that an agent's action will influence others to adopt the same action to gain (Ah Mand & Sifat, 2021a).

Principal-Agent Models: Managers may follow the herd to protect or improve their reputation, especially when information is limited. It can lead to them "hiding" or "riding" in herds to demonstrate the quality of their work. These Models focus on the actions of managers to protect their reputations (Ah Mand & Sifat, 2021).
Informational Cascade Models: Agents may make decisions based on the actions of others, ignoring their information and relying on the assumption that others are better informed (Ah Mand & Sifat, 2021; Demirer et al., 2010b; Liu & Gu
an, 2006). It can occur when individuals conclude that the masses are better informed, regardless of the quality of that information (Ayhan Kapusuzoglu, 2011).

Irrational Perspectives:
Psychological Factors: Some Models focus on investor psychology, suggesting that individuals act like herds and unthinkingly follow each other, even when it goes against their information (Ayhan Kapusuzoglu, 2011). This perspective highlights that investors may mimic the actions of others due to emotional or psychological factors (Ah Mand & Sifat,

2021a). This perspective highlights that investors may mimic the actions of others due to emotional or psychological factors (Ah Mand & Sifat, 2021a).
Social Influence: Investors can be influenced by social gatherings or the actions of family and friends, leading them to disregard their information and mimic others (Afrin, 2024; Ah Mand & Sifat, 2021a). It can happen when investors believe the masses are better informed (Ayhan Kapusuzoglu, 2011).

Other Perspectives & Considerations:
Behavioral Finance Models: These models also contribute to the herding study, considering it an anomaly resulting from investors' decision-making processes (Ah Mand & Sifat, 2021b).
Intentional vs. Spurious Herding: It is important to differentiate intentional herding, where investors consciously follow the consensus, and spurious herding, which might occur due to other market factors (Kyriazis, 2020; ÖZSU, 2015).

Micro vs. Macro Approaches: Some studies focus on micro-level herding, examining the behavior of specific types of investors. Other studies take a macro-level approach, looking at market activities and prices (da Gama Silva et al., 2019b).

Market-Wide vs. Stock-Specific Herding: Market-wide herding involves investors following general market trends, while in stock-specific herding, investors mimic other investors while investing in a specific stock (Ah Mand & Sifat, 2021a).

RQ3. Research methods included utilized in herd behavior along with CSSD and CSAD.
CSSD Christie & Huang (1995) and CSAD Chang et al. (2000) techniques are static, but the techniques mentioned in Table 5 are dynamic. The regime-switching Model helps in identify market regimes, providing a micro-level understanding of herding behavior (Abou Tanos & Meharzi, 2024). The quantile regression method, further used by the researchers, allows us to trace the impact of herding across different quantiles of return distribution.

Table 5- Types of statistical methods used in the studies other than CSSD and CSAD

Statistical Tools Used	Study
Regime-Switching Models, Quantile Regression, Hodrick-Prescott Filter	(Abou Tanos & Meharzi, 2024)
Ordinary Least Squares (OLS) Regression, Time-Varying Window Analysis	(De Silva et al., 2024)
Static Herding, Time-Varying Herding	(Xiaoyang et al., 2024)
Markov Chain Monte Carlo (MCMC), Time-Varying Parameter (TVP) Regression	(Mohamad, 2024)
DCC-GARCH, Dynamic Connectedness Approach, TVP-VAR	(Gouta & BenMabrouk, 2024)
Structural Breakpoint Analysis	(Dhuri & Patkar, 2024)
GJR-GARCH model	(Wang, 2024)

Source: Author's compilation

De Silva et al., (2024) used Time-Varying Window Analysis to detect herding over specific intervals of time according to changes in the market conditions. Mohamad, (2024) applied the Markov Chain Monte Carlo (MCMC) method to estimate complex models and provided deeper insight than traditional methods. Gouta & BenMabrouk (2024) utilized the GARCH Model to examine the correlation that varies according to the time interval between assets.

RQ4- Possibilities for the future research

The current study shed light on tracing herd behavior in the financial market using CSSD and CSAD approaches. This section presents the probable fields of research that may explored in the future.

a. Exploration of Developing Markets: Most studies have yet to figure out herd behavior in the developed market. Several developing markets have yet to be explored Several developing markets have yet to be explored. T. Nguyen (2022) reported that Vietnamese investors follow the moves of Singaporean investors and experts, while both markets are distinct. It is a matter of concern for the developing countries.

A sudden emotional anxiety that travels between markets may create a disaster for small investors. It is an area that researchers need to address in the context of herd behavior.

b. Impact of Technological Advancement Xiaoyang et al. (2024) have explored the herd behavior that arises when AI and Google Assistant are used to make investment suggestions. When an investor's group acts on the same suggestion, it may lead to herd behavior. It is the only study available in the Scopus database. In the present scenario, while investors are looking towards the stock market as a second income option, it is a grey area to study. Moreover, the suggestions convince investors of the stock experts; most have a presence on YouTube, X, and Facebook. These experts continuously post suggestions for their followers. Investor's collective actions to buy or sell a stock may create an anomaly inspired by herding behavior. The researchers must acknowledge this field and discover how investors' behavior is affected by technological advancement.

c. Different Asset classes

Herd behavior is not just limited to the stock market; it can also affect several other asset classes. Although researchers have concentrated on cryptocurrency and oil and gas, several asset classes like real estate and bullion still need to be explored.

Especially in India, the commodity trading of cotton and millet is traded on a large scale. However, studies on the Investor's behavior in such a market are scarce.

Conclusion

This bibliometric study has examined the research articles that utilized CSSD and CSAD approaches to tracing herding behavior in the financial market. This research paper provides deeper insights for future research. The article systematically addressed four research questions, beginning with the evolution of the concept of herd behavior. Secondly, trends of the study, prolific researchers, frequently used keywords and themes. Third, additional statistical tools were applied to study herd behavior. Fourth, possibilities of future research. This article highlighted the seven clusters of financial markets utilizing the CSSD and CSAD approaches. These clusters assist the researchers in identifying the emerging areas of research in the field. The continuous transmission of information stimulates herd behavior. Machine Learning-enabled social media platforms are providing market recommendations in the form of convincing text and video content. Investors have followed the recommendations without expert confirmation. The researchers must address the impact of such recommendations on investors. Another emerging area of research is herd behavior, which is stimulated by unrest

in global politics. While some researchers have initiated in Western countries, many developing economies still need to be explored. Another promising area of research is herding behavior influenced by geopolitical unrest. This study highlights emerging fields of future research, particularly in under-researched markets and the impact of AI-driven investment strategies.

Discussion-

This research paper offers a review of research techniques to trace the presence of herd behaviour in financial market. Although, limitations exist with every technique still CSSD and CSAD techniques exhibits their relevancy. In the due course of time, other techniques amplified the strength of these tests. A. P. N. Nguyen et al., (2024) applied Graph-Based techniques such as Minimum Spanning Tree (MST), and Louvain Community Detection. Dhuri & Patkar, (2024a) applied Bai Perron Test to trace structural break points. Furthermore, the econometric techniques GARCH (Wang, 2024) and EGARCH can be applied on the financial market data. Huang et al., (2023) underlined the limitation of CSSD and CSAD models like oversimplification by using linear relationship, sensitivity to outliers suitable for the extreme moments of volatility.

Limitations

This research work followed substantial protocols for performing bibliometric analysis. Still, the findings consist of several restrictions. First, the study considered Scopus's database only. Secondly, the research only considered articles published in English. The researchers may overlook the relevant research published in a field other than English.

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