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Herding Behavior in Financial Markets: Tracing the Evolution of Knowledge Through a Systematic Review and Bibliometric Analysis

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Abstract

This study examines how research on herding behavior in financial markets evolved between 1990 and 2025. The study included bibliometric analysis and a systematic review based on the SPAR-4-SLR methodology. VOSviewer and Bibliometrix software were used to map the themes, trends and collaboration of the research. Keyword clusters and conceptual maps indicated a transition from simple market explanations to interdisciplinary approaches including behavioral economics, social learning and digital information pathways. There were four periods. Between 1990 and 2000, the leading explanations of herding were information cascades and reputational concerns. Work from the period 2000-2010 included psychological elements such as loss aversion and overconfidence, as well as agent-based modeling. Systemic risk was still a potential worry. The literature after the 2008 crisis during 2010-2015 highlighted the market crashes and systemic risks as the main effects of the crisis. The asset price bubbles were the precursors of the crises rather than the consequences of the crises. Asset price bubbles resurfaced with the emergence of cryptocurrencies, NFTs, and meme-stock markets driven by social media and algorithmic herding over the period of 2015–2025. Researchers explored systemic vulnerabilities in algorithmic trading, high-frequency data, and machine learning. The findings shed light on the changing link between market microstructure and behavioral finance.

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1. Introduction

Financial markets are complex adaptive systems in which individual decision-making processes interact dynamically with institutional structures, information flows, and macroeconomic forces. Contrary to the assumptions of perfectly rational agents implicit in classical financial theory, a growing corpus of empirical research has shown that investment decisions are considerably impacted by emotions and psychological aspects. The extensive research on these factors of behavior has led to the emergence of a separate and powerful research paradigm called behavioral finance. In this context, market outcomes are not simply a reflection of fundamentals but are the consequence of cognitively restricted, socially rooted and emotionally driven individuals.

Among the various behavioral phenomena examined in this literature, herding behavior broadly defined as the tendency of investors to follow the actions of others rather than rely on their own private information has attracted substantial empirical and theoretical attention (Choi and Yoon, 2020; Assoe et al, 2025; Vieito et al., 2024; Schmitt and Westerhoff, 2017; Bogdan et al., 2022; Ah Mand et al., 2023; Hasan et al., 2023; Cipriani and Guarino, 2014). The concept of herding is not confined to finance; rather, it has deep intellectual roots across multiple scientific disciplines, including neuroscience, zoology, sociology, economics, and finance (Spyrou, 2013).

In financial markets, herding is a behavioral pattern where market participants intentionally ignore their own analyzes and follow the actions of other investors or current market trends (Lima and Schimit, 2023). Earlier theoretical and empirical work has found that herding can occur both when agents are rational and when they are irrational. Bikhchandani and Sharma (2000) show that herd behavior can be explained by both rational reactions to informational contexts and non-rational behavioral biases. Rational herding is when investors intentionally ignore their own information and trust the signals they draw from others' actions (Chiang and Zheng, 2010). This approach emphasizes the role of informational cascades (Banerjee, 1992; Bikhchandani et al., 1992), compensation policies (Scharfstein and Stein, 1990; Admati and Pfleiderer, 1997), and reputational considerations (Prendergast and Stole, 1996; Trueman, 1994) as the primary forces that determine collective behavior. Irrational herding, in contrast, happens when investors come to the same conclusions because they get information from the same sources or share the same mental biases, and they act together without evaluating the situation independently. Empirical data suggest that herding increases market volatility, distorts asset values and worsens the fragility of the market (Wray and Bishop, 2016). The effects have been recorded across asset classes, from equities and bonds to commodities, foreign exchange and cryptocurrencies and throughout developed and emerging markets. Therefore, herding is considered to be a significant source of financial instability and systemic danger.

Over the past three decades, research on herding behavior has expanded markedly in both scope and methodological sophistication. Early studies primarily relied on cross-sectional measures of return dispersion and relatively simple econometric techniques. High-frequency data, nonlinear models, agent-based simulations, network analysis, and machine learning techniques have all been used in more recent contributions. Despite this large amount of work, the literature is highly fragmented, with significant variety in theoretical viewpoints, empirical proxies, data sources and analytical methods. As a result, a clear understanding of how knowledge on herding behavior has evolved and which intellectual streams have been most influential remains difficult, underscoring the need for systematic, longitudinal, and quantitatively grounded syntheses of the field.

This study therefore seeks to trace the evolution of knowledge on herding behavior in financial markets from 1990–2025 by combining systematic review and bibliometric analysis. Drawing on a comprehensive dataset extracted from the Web of Science Core Collection, we employ analytical procedures to conduct citation, co-citation, co-authorship, and keyword co-occurrence analyses.

Together, these techniques provide a longitudinal mapping of the field's intellectual foundations, dominant themes, methodological trajectories, and geographic patterns of knowledge production.

Through a structured, data-driven synthesis of more than three decades of research, this article makes several contributions. First, it integrates a fragmented literature into a coherent body of knowledge and offers insights into the evolution of theoretical viewpoints and empirical methods on herding behavior across time. Second, it highlights the important writers, journals and organizations that have helped shape the evolution of the area. Third, it points to new issues and uncharted territory that deserve additional research, especially in view of continuous technological and institutional changes in financial markets. The overall goal of this work is to provide scholars, policymakers and practitioners with a thorough and forward-looking knowledge of herding behavior as a core phenomenon in modern finance.

The following research questions guide the review of the literature's evolution, intellectual structure, and emerging directions:

RQ1: How has the concept of herding behavior in financial markets evolved over the past three decades, and what are the emerging theoretical and practical implications for policymakers, investors, and financial institutions?

RQ2: What are the annual publication trends (1990–2025) and the key thematic evolutions reflected in author keywords in the herding behavior literature?

RQ3: How do multiple correspondence analysis (MCA) maps and three-field plots (authors, journals, keywords) visualize the conceptual structure and actor interplay in herding behavior research, and how do these two complementary visualizations inform our understanding of the field's evolution?

RQ4: What insights do author keyword co-occurrence analysis and reference co-citation analysis provide regarding the thematic and conceptual development of the global herding behavior literature?

RQ5: How do the following aspects shape the social and intellectual structure of herding behavior research: (i) the top-ten most productive and influential sources; (ii) the most cited countries (by corresponding authors and citation impact) and the global distribution of scientific output; (iii) global and regional collaboration networks along with the top-ten most productive affiliations; and (iv) the most globally and locally cited documents?

This study is structured as follows: Section 1 provides an overview of the research topic and objectives in the Introduction. Section 2 synthesizes existing knowledge in the Literature Review, while Section 3 details the research design and techniques in the Methodology. Section 4 presents and analyzes the findings in the Research Results and Discussion, followed by Section 5, which summarizes the study's contributions in the Conclusion and Limitations.

2. Literature review and theoretical issues

Due to its implications for market efficiency, volatility, and bubble creation, herding behavior in financial markets has drawn much scholarly interest. In the past 30 years, herding research has progressed from theoretical models of the underpinnings of herding to sophisticated empirical studies drawing from economics, psychology, and network theory. This literature review tracks the evolution of understanding of herding behavior from the initial conceptualization through the most recent breakthroughs, highlighting major shifts in knowledge and the methods used to explore this complex phenomenon.

2.1. Mechanisms and outcomes of herding behavior in financial markets

Figure 1 illustrates the factors that generate and magnify herding behavior in financial markets in

a multi-layered model, emphasizing their intricate linkages. The drivers of herding are located in the first layer, which includes the drivers of herding, i.e., information asymmetry, market uncertainty, limited attention, reputational concerns, and algorithmic signals, which generate situations in which herding is more likely. Information asymmetry is when market participants are not all privy to the same information, and so have to base their decisions on the decisions of others. Market uncertainty is characterized by volatility and ambiguity, which further pushes investors to emulate the choices of others. The pressure to go with the herd is further compounded by limited attention and reputational worries, as investors may pay heed to current trends or care about their professional status. In addition, the algorithmic signals of automated trading machines tend to accentuate this behavior and increase the collective actions of market players who are not fully informed.

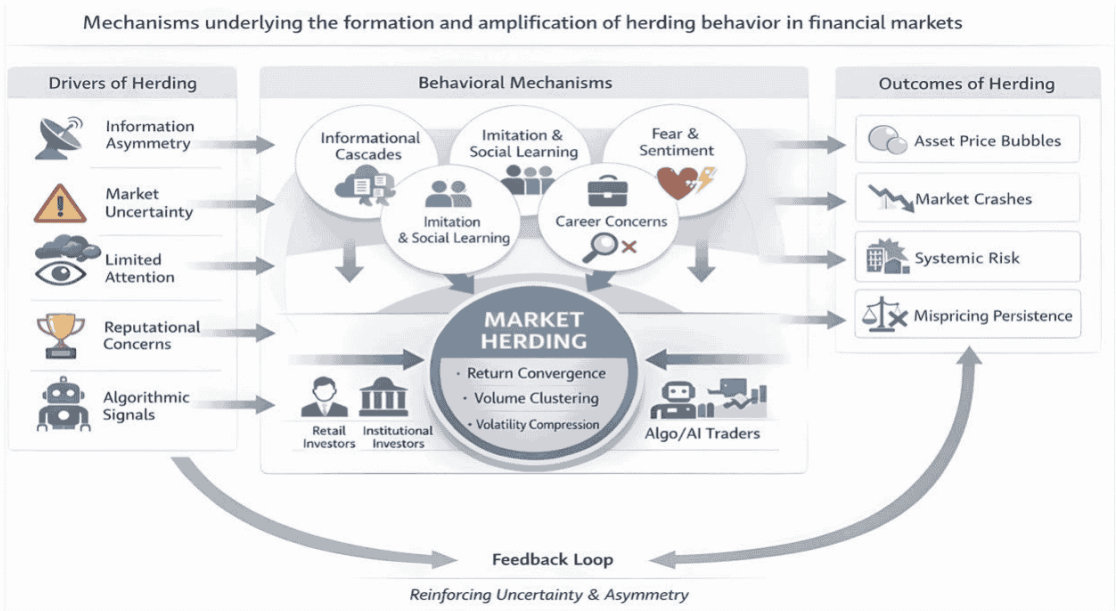


Figure 1. A multilayer mechanism of herding formation and amplification in financial markets

The second layer, behavioral mechanisms, discusses the psychological and social factors that underlie herding, including informational cascades, imitation, social learning, fear, sentiment, and career concerns. There are informational cascades when people follow the activities of others, thinking they have better information than they do, and imitation and social learning when people imitate others to reduce uncertainty and risk. Herding is generally motivated by emotions such as fear and mood, particularly during times of market turmoil when investors react to market movements rather than their own analysis. Professional investors may also herd due to career concerns: they want to prevent the personal or reputational danger that could arise. 3. At the investor level, retail investors, institutional investors and algorithmic traders each interact differently with various behavioral mechanisms and each impacts herding at the market level. At the market level, herding behavior results in observable phenomena such as convergence of returns, clustering of volumes, and compression/expansion of volatility, which may result in the destabilization of markets. Herding can lead to asset price bubbles, market crashes, systemic hazards and persistent mispricing, all of which are consequences of collective behavior that pushes asset prices away from their basic values. The feedback loop shows how market results increase uncertainty and informational asymmetries, generating a cycle that maintains herding behavior and intensifies future market distortions and instability.

2.2. Introduction to herding behavior in financial markets: conceptual framework and early contributions (1990-2000)

In financial markets, herding behavior refers to a situation in which market participants disregard their own analyses and instead imitate the decisions of other investors or follow prevailing market trends that have already emerged (Lima and Schimit, 2023). In the early theoretical literature, herding was formally explained through a sequential decision-making framework in which each decision-maker observes the actions taken by previous decision-makers before forming her own choice. Such behavior can be rational because individuals may infer that earlier actors possess private information that is relevant for their own decisions. However, it is shown that the decision rules adopted by optimizing individuals in this setting become inherently characterized by herd behavior, meaning that individuals ultimately choose to do what others are doing rather than rely on their own information. Consequently, the equilibrium outcome generated by this process is inefficient (Banerjee, 1992). Building on this foundation, early studies conceptualized herding as a form of market failure, particularly evident during periods of heightened volatility and uncertainty, where information asymmetry and social influence amplify market trends and contribute to overreactions and speculative bubbles, while empirical validation at this stage remained relatively limited.

In the papers surveyed for the period 1990-2000, a major result of herding behavior was the production of information cascades, indicating an increasing academic interest in the foundations of herding in financial markets and in organizational settings. Another significant reinforcing mechanism uncovered was reputation concerns. Here, individuals strategically modify their behavior to be consistent with their earlier decisions to retain their social standing, despite evidence to the contrary. Thus, the interaction of informational and reputational dynamics became a prominent subject in early behavioral economics and organizational sociology.

2.3. Evolution of herding models and integration of behavioral psychology (2000-2010)

The 1990s set the stage for herding by investigating herding with informational cascades and reputational concerns. The next decade (2000-2010) was a real turning point where researchers started to explicitly incorporate psychological mechanisms in herding models, thus moving beyond purely rational explanations. This transformation is an example of the main goal of the paper: looking at the evolution of herding behavior in financial markets from 1990 to 2025, showing that psychological causes become crucial to understanding collective dynamics.

By the early 2000s, the study of herding behavior in financial markets has started to move beyond the limits of strictly rationalist models, including ideas from behavioral economics and psychology to explain the observed deviations from conventional market efficiency. The application of prospect theory in herding models offers a framework to explicitly account for the effect of biases in cognition such as loss aversion, overconfidence and mental accounting on individual decisions and subsequently on the collective market behavior. In this period, empirical and experimental studies showed that investors are influenced by the behavior of others not only because of informational asymmetries, but also due to psychological pressures and social conformity, causing systemic phenomena like panic selling, momentum-driven bubbles and sudden reversals. Furthermore, the rise of agent-based modeling (ABM) has offered a computational framework to mimic these intricate interactions, illustrating how micro-level behavioral heuristics can lead to macro-level herding effects and market instabilities. ABM is not employed here as an isolated technical exercise; rather, it directly operationalizes the psychological and social mechanisms discussed above, offering a testable simulation framework that informs our period-by-period empirical analysis of herding across three decades. This decade thus marked a critical shift in herding research, emphasizing that psychological factors are not peripheral but fundamental drivers of collective behavior in financial markets, bridging

the gap between theory and empirically observed market dynamics. In line with this, Bernardo and Welch (2001) explain why seemingly irrational overconfident behavior can persist: information aggregation is poor in groups in which most individuals herd, and by ignoring the herd, the actions of overconfident individuals ("entrepreneurs") convey their private information. However, entrepreneurs make mistakes and thus die more frequently. The socially optimal proportion of entrepreneurs trades off the positive information externality against high attrition rates of entrepreneurs, and depends on the size of the group, on the degree of overconfidence, and on the accuracy of individuals' private information. The stationary distribution trades off the fitness of the group against the fitness of overconfident individuals. This finding is directly relevant to our overarching framework because it demonstrates how a specific psychological bias (overconfidence) can sustain herding even when rational aggregation fails, thereby providing a micro foundation for the persistent herding patterns we trace across different market regimes from 1990 to 2025. Complementing this perspective, Prechter (2001) highlights that human herding behavior results from impulsive mental activity in individuals responding to signals from the behavior of others. Impulsive thought originates in the basal ganglia and limbic system. In emotionally charged situations, the limbic system's impulses are typically faster than rational reflection performed by the neocortex. Experiments with a small number of naïve individuals, as well as statistics reflecting the behavior of large groups of financial professionals, provide evidence of herding behavior. Herding behavior, while appropriate in some primitive life-threatening situations, is inappropriate and counterproductive to success in financial situations. Unconscious impulses that evolved to attain positive values and avoid negative values spur herding behavior, making rational independence extremely difficult to exercise in group settings. A negative feedback loop develops because stress increases impulsive mental activity, and impulsive mental activity in financial situations, by inducing failure, increases stress. The interaction of many minds in a collective setting produces super-organic behavior that is patterned according to the survival-related functions of the primitive portions of the brain. As long as the human mind comprises the triune construction and its functions, patterns of herding behavior will remain immutable. Prechter's neuropsychological perspective is not merely an exploration of individual psychology in isolation; rather, it explains why herding is a hardwired, recurrent phenomenon across time periods, directly supporting our paper's contention that herding behavior exhibits both temporal evolution and underlying constancy, a duality we explicitly examine across the 1990–2025 timeline.

2.4. Financial crises and herding behavior: insights from the 2008 global financial crisis

The 2008 Global Financial Crisis (GFC) represents a pivotal episode in the study of herding behavior, offering unambiguous real-world evidence of how herd-like actions among financial institutions and retail investors can amplify market instability. However, to avoid a reductionist account – one that would portray the crisis as the sole or primary driver of herding – it is essential to recognise that the GFC did not originate herding ex nihilo; rather, it functioned as a powerful amplifier that interacted with pre-existing behavioral biases (e.g., loss aversion and overconfidence), psychological pressures (panic and social conformity), and structural vulnerabilities (high leverage, interconnected counterparty risks, and regulatory gaps). Herding behavior, in this view, emerges from a confluence of individual-level cognitive heuristics, collective social dynamics, and market architecture – factors that were present well before 2008 and were merely exacerbated by the crisis.

In the articles reviewed from 2010 to 2015, market crashes and systemic risks emerged as the predominant consequences of herding behavior. Asset price bubbles continued to be debated, but they

were most often framed as antecedents to crashes rather than independent outcomes. Mispricing received less emphasis as researchers increasingly focused on contagion, network-driven failures, and real-world crisis events. The path of this sub-period illustrates the increasing interest in systemic risk studies after the global financial crisis of 2008, when herding is considered one of the primary amplifiers of market crashes in interconnected financial institutions.

Post-GFC studies have explored the effect of herding at the time of market crashes, providing insight into the psychological drivers of panic-driven behavior. These studies reveal that investors tend to overreact to bad news, but this overreaction is not automatic or uniform. It is dependent on external signals, such as media reports, government initiatives, and the conduct of major market players. During this time, network theory was also applied to herding studies as financial markets were increasingly viewed as complex networks of interrelated agents where influence might cascade fast through the system. The network view underscores the idea that herding is not simply about individual actions but a result of patterns of interaction and diffusion of information, a factor that was under-investigated before the crisis.

In this setting, Abbes (2013) examines crisis transmission by examining herding contagion during the 2008 GFC across Asian and European financial markets. Using a statistical technique to measure volatility spillovers between markets, the study finds that US stock market volatility during the subprime crisis was significantly transmitted to Asian and European markets. Moreover, the UK and Swiss markets played an important role in emitting volatility to Asian markets, while Singapore constituted the Asian channel through which the crisis spread across global equity markets. An additional analytical method (comparable to a Kalman filter) was applied to estimate index return residuals after controlling for macroeconomic fundamentals and global shocks. All residuals exhibited heightened volatility during the mid-2007 to 2008 crisis period. Furthermore, cross-country residual correlations between the US and European/Asian markets increased during the turmoil period relative to a tranquil period. This evidence points to herding contagion in Asian and European markets during the US crisis and partly explains the severity of the GFC. Notably, the study demonstrates that herding behavior intensifies and spreads across borders precisely during the crisis period (2010–2015) – yet this intensification would not have occurred without pre-existing structural fragilities and behavioral predispositions. Thus, the work illustrates how the transition from a pre-crisis theoretical phase to a post-crisis empirical phase manifests in actual market data.

Given the systemic significance of the GFC, a substantial body of research has examined its role in amplifying herding behavior across financial markets. These studies highlight how periods of extreme uncertainty intensify collective decision-making and synchronised investor responses (Philippas et al., 2013; Galariotis et al., 2015; Bohl et al., 2014; Tsuchiya, 2015). They are directly relevant to the broader hypothesis of analysing herding behavior in financial markets from 1990 to 2025, as they collectively demonstrate how herding manifests during extreme market events and provide empirical evidence of behavioral contagion across different regions and time periods. Importantly, and consistent with avoiding a reductionist view, these works do not isolate the crisis as a singular cause. Instead, they converge on the conclusion that the crisis exacerbated pre-existing behavioral predispositions and structural fragilities – such as information asymmetry, misaligned agency incentives, low financial literacy among retail investors, and positive feedback trading mechanisms – that were already embedded in financial systems. Consequently, throughout this section, the 2008 crisis is treated not as the exclusive driver but as a contextual amplifier interacting with psychological, structural, and informational factors.

2.5. Technological advancements and the evolution of herding behavior in financial markets: a decade-long perspective

In the most recent decade (2015–2025), systemic risks remained one of the most prominent outcomes, but are now studied in the context of algorithmic trading, high-frequency data, and machine learning. Asset price bubbles re‑emerged strongly due to the rise of cryptocurrency, NFT, and meme stock markets, often driven by social media and algorithmic herding. Mispricing also became highly discussed, particularly temporary mispricing induced by high-frequency trading and information cascades. The trend across this decade shows a diversification of outcomes: systemic risks remain persistent, while bubbles and mispricing have resurged with technological innovation. Moreover, the interaction between algorithmic trading and herding has created new forms of price inefficiencies that were absent in earlier periods.

Recent studies focusing on digital asset markets illustrate how technological infrastructures amplify herding through tightly coupled information and price channels. Yu et al. (2025), examining time‑varying herding in NFT and cryptocurrency markets during the COVID‑19 and post‑pandemic period, document persistent herding behavior driven by macroeconomic announcements, particularly those related to U.S. monetary policy. Their analysis reveals that herding dynamics are sensitive to global policy signals, and they find that the NFT market exerts a measurable influence on Ethereum prices, thereby transmitting herding effects into the broader cryptocurrency ecosystem. Importantly, their findings suggest that NFTs retain partial structural independence from cryptocurrency price volatility, highlighting a technologically mediated segmentation of herding that carries implications for portfolio diversification and digital asset risk management (Yu et al., 2025).

Empirical research on high-frequency and algorithmic trading further reinforces the argument that technological intermediaries actively shape non-fundamental herding. Fu et al. (2026) provide evidence that the herding caused by algorithmic trading is much higher than the herding induced by non-algorithmic factors, especially during periods of high global uncertainty. Meanwhile, the authors find evidence of algorithmic anti-herding in volatile aggressive equities, pointing to a dual behavioral role of automated trading systems, which changes between market regimes and asset characteristics.

The integration of machine learning and sentiment-enhanced models has further refined the measurement and interpretation of herding behavior. Asim et al. (2024) demonstrate robust evidence of herding in the UK stock market in several time regimes and find that integrating news emotion on economic uncertainty significantly increases the capacity to detect herding. Their comparison shows that flexible machine learning algorithms perform better than standard linear methods when detecting herding, especially in systemic stress periods such as the global financial crisis and the COVID-19 era. Consistent with these findings, Loang (2025) finds that dynamic machine-learning models that incorporate market sentiment, news sentiment, and investor pleasure indicators beat traditional static herding metrics in the U.S., Chinese, and Indian markets. These results show that algorithmic systems can explain the adaptive and context-dependent properties of herding rather than standard econometric approaches, contradicting static views of market efficiency.

Finally, research at the individual-investor and portfolio level highlights how technologically mediated attention and behavioral biases interact with herding outcomes. Mavruk (2022) employs machine-learning algorithms to analyze herding among individual investors and finds that behavioral factors such as the disposition effect and attention bias play a central role in driving collective trading decisions. The study further shows that herding investors do not outperform non-herding portfolios and that herding contributes to temporary price deviations followed by reversals toward fundamentals, reinforcing the destabilizing nature of such behavior in technology-intensive markets.

Collectively, this literature suggests that technological progress between 2015 and 2025 has not only increased herding behavior, but also modified its structure, transmission methods, and market repercussions. To fully capture the evolving nature of herding in contemporary financial markets, an integrative analytical framework that bridges behavioral finance, market microstructure and information network theory is required to account for the simultaneous role of automated trading systems, machine-learning-driven strategies, and digitally networked information flows as catalysts and conduits of collective behavior.

3. Methodology

This study adopts a systematic, transparent, and reproducible methodological framework to examine the intellectual evolution of herding behavior research in financial markets from 1990 to 2025. The methodology follows a PRISMA 2020-guided systematic review protocol for literature identification, screening, and inclusion/exclusion, ensuring rigorous data preprocessing. The final corpus, retrieved from the Web of Science Core Collection and Scopus, comprises peer-reviewed articles spanning three decades. For performance-based bibliometric analysis (using the Biblioshiny-R package bibliometrix 4.0), we compute: (i) the Top Ten most productive publication sources; (ii) Top Ten authors' publication output; (iii) most productive affiliations; (iv) global citation impact by country with normalized citation metrics; (v) most influential globally cited studies (total citations); (vi) most locally referenced works within the corpus; (vii) collaboration networks at author and country levels; and (viii) global distribution of scientific production via choropleth mapping.

To identify the intellectual structure and its evolution, we apply advanced network-analytic techniques with explicit network specifications. Four network types are constructed using VOSviewer 1.6.20 and Biblioshiny: (1) keyword co-occurrence networks to identify dominant and emerging research themes; (2) co-citation networks of references to map intellectual foundations and schools of thought; (3) co-authorship networks (author and country levels) to examine collaboration patterns; and (4) a multiple correspondence analysis (MCA) conceptual map to visualize conceptual proximity among key terms. For each network, we compute three centrality measures degree centrality (identifying the most connected nodes), betweenness centrality (detecting bridges between clusters), and eigenvector centrality (capturing influence within highly connected subnetworks). Temporal dynamics are analyzed through Thematic Evolution across three sub-periods (1990–2005, 2006–2017, 2018–2025) and Trend Topics analysis, which tracks keywords with significant frequency growth over time. All parameters are documented to ensure full reproducibility. Collectively, this integrated framework provides a robust foundation for mapping the structural and temporal dynamics of herding behavior research and positioning emerging frontiers within the broader financial economics literature.

3.1. Search queries applied in the Web of Science database

Table 1 presents the search queries we applied in the Web of Science (WOS) database. We utilized keywords like "herding behavior", "herd behavior" and "investor herding" to search the relevant literature. We concentrated on journal publications (original research articles and review articles) within the discipline of Business Economics. To guarantee uniformity in the analysis, all selected publications were in English. This search strategy identified studies pertinent to the topic of herding behavior in financial markets.

Table 1. Search queries applied in Web of Science database

Journal Database	Search Queries	Publication Types	Research Area	Language
Web of Science (WOS)	TS= ("herding behavior" OR "herd behavior" OR "investor herding")	Journal article (Article, Review Article)	Business Economics	English

3.2. An integrated bibliometric framework for herding behavior research in financial Markets

Figure 2 presents the integrated methodological framework employed to systematically trace the evolution of scholarly knowledge on herding behavior in financial markets from 1990 to 2025, in three sequential, interdependent phases. In the first phase, peer-reviewed articles and reviews are retrieved from the Web of Science core collection using the query ("herding behavior" OR "herd behavior" OR "investor herding") together with strict inclusion criteria for disciplinary relevance, methodological consistency, and temporal coverage; the raw records are then exported to Excel, which serves as a central hub for data organization and transfer to subsequent analytical environments. The second phase performs data preprocessing (cleaning, deduplication, and standardisation) also in Excel, followed by bibliometric analysis using two established tools – VOSviewer and Bibliometrix (an R-based package) – to uncover publication dynamics, intellectual structures, and collaborative patterns through citation-based indicators and network centrality measures, thereby identifying influential authors, core themes, and evolving research clusters via co-citation networks, keyword co-occurrence maps, and thematic evolution plots. The third phase examines temporal trends in relation to major financial events, synthesizes dominant theoretical and empirical approaches, and employs visual analytics that go beyond standard bibliometric outputs: Python (Google Colab) is used to generate custom graphical representations of data trends, including annual publication trajectories, burst detection line charts, and heatmaps of keyword frequency shifts, directly illustrating the conceptual and methodological evolution of herding research. Together, these procedures support analytical rigour, transparency, and reproducibility, providing a comprehensive and systematic mapping of the knowledge base and research frontiers in herding behavior within financial markets.

3.3. PRISMA-based selection of studies for the bibliometric analysis of herding behavior

Figure 3 presents the PRISMA-based literature identification and screening process used to construct the final dataset for the bibliometric analysis of herding behavior in financial markets. The identification phase began with a comprehensive search of the Web of Science (WoS) core collection, which returned 1,957 records. Prior to the formal screening, a total of 1,051 records were removed based on four predefined exclusion criteria: (i) 7 duplicate records; (ii) 12 records excluded because their publication year fell outside the 2000–2023 range (publication year constraint); (iii) 92 records excluded based on document type (original and review articles were retained; conference proceedings, book chapters, editorials, and early access documents were removed); and (iv) 940 records excluded because their assigned WoS Research Area categories did not align with the scope of this study. Specifically, the analysis retained only records categorized under Business Finance, Economics, Management, Business, and Operations Research & Management Science. Excluded categories included, but were not limited to, Environmental Sciences, Ecology, Psychology (general), Computer Science, Engineering, Mathematics, and Agricultural Economics. To ensure full operational transparency and reproducibility, the inclusion rule was defined as follows: a record was retained if at least one of its assigned WoS Research Areas matched any of the five pre-specified categories. Records with multiple Research Areas (e.g., Economics and Environmental Sciences) were included because they contained at least one retained category. Conversely, records whose Research Areas contained none of the five included categories were excluded. After this initial

filtering, 906 records remained and were subjected to title and abstract screening to assess their preliminary relevance to the study objectives. As shown in the PRISMA diagram, this step excluded 14 records, leaving 892 reports sought for retrieval. Full-text assessment led to the exclusion of another 16 reports that were not relevant to the study objective, resulting in a final set of 876 studies included in the review.

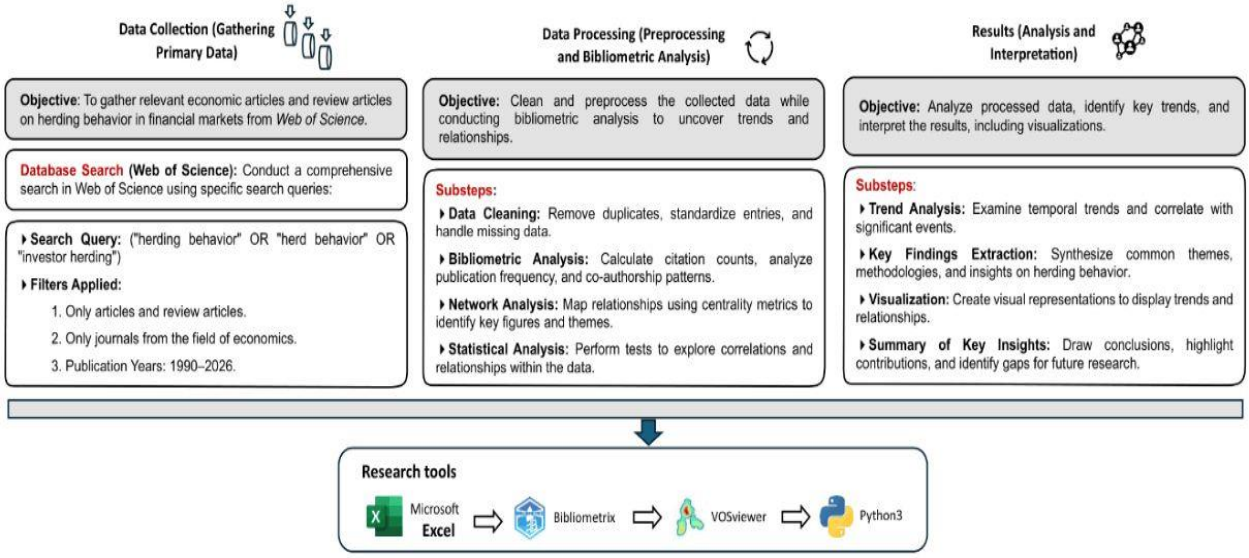


Figure 2. Data processing and results analysis framework for herding behavior in financial markets

4. Results and discussion

This section presents and discusses the results of our systematic review and bibliometric analysis of herding behavior research in financial markets covering the period 1990–2025. In this paper, we contribute an extensive review of the evolution of the academic knowledge on herding behavior through the analysis of publishing trends, citation patterns and thematic networks, as a response to theoretical advances and key financial events. We interpret the results in terms of the intellectual structure of the subject, pointing out dominating research streams, rising topics and persisting gaps, and we contextualize these patterns in the wider context of financial economics.

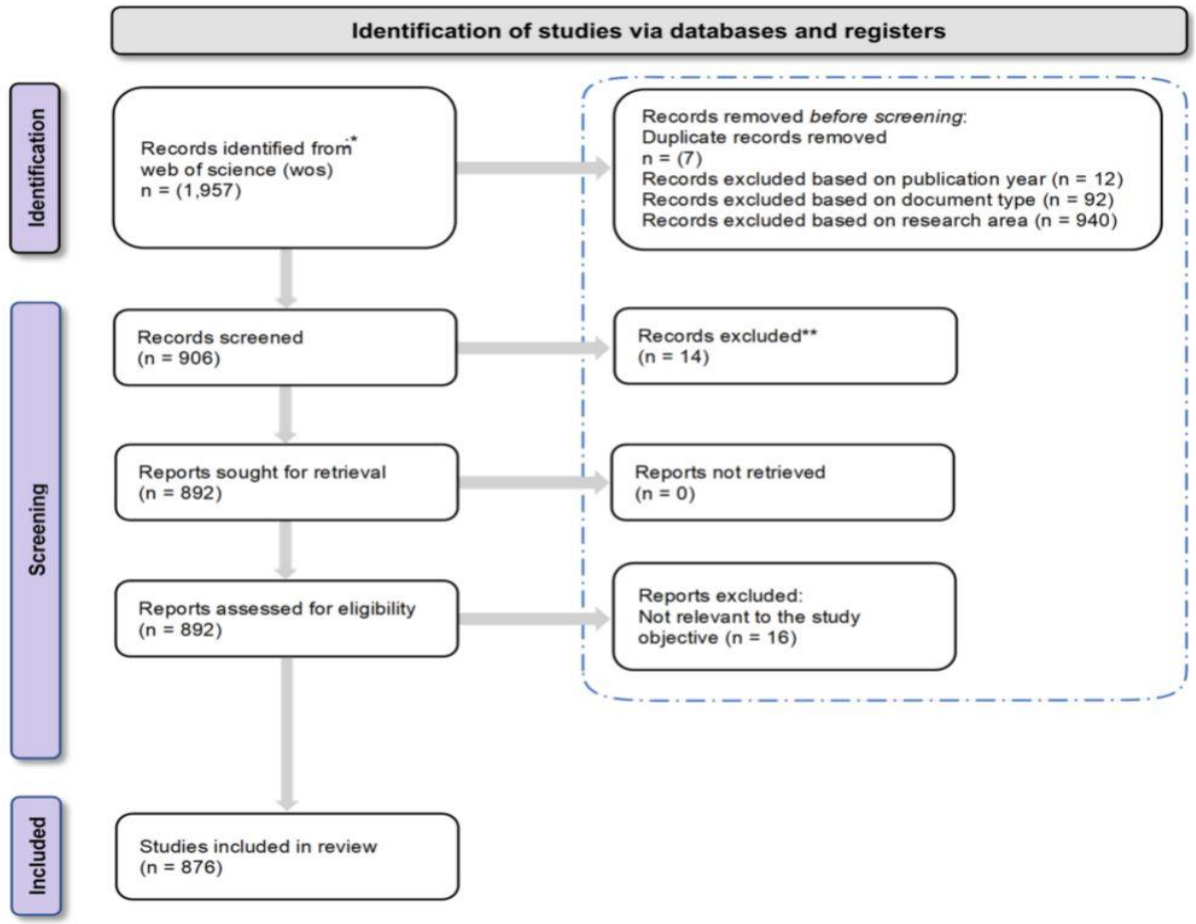


Figure 3. PRISMA literature screening process

4.1. Mapping research questions to methodological approaches and outcomes

Table 2 outlines the mapping between our research questions and the corresponding methodological approaches and outcomes. Each research question was addressed using a specific analytical tool and methodology, such as systematic literature review, bibliometric analysis, and manual review. The tools employed are Python 3, Bibliometrix (RStudio), and VOSviewer, which helped in extracting trends, network analyzes, and conceptual mappings on herding behavior in financial markets. The table presents the relationship between the methodological approach and each research subject, specifying the analytical methods used to investigate the changing trends, scientific production and global academic cooperation. This mapping gives a structured platform to explore the theoretical and practical ramifications of herding behavior in the last three decades.

4.2. Structured content analysis of herding behavior in financial markets

Table 3 structures the intellectual development of the herding behavior study. The key and most cited studies in the period 1990-2013 are integrated into an analytical framework. The field's evolution is traced from early theoretical models explaining the rationality and social dynamics of herding (e.g. Banerjee, 1992; Scharfstein and Stein, 1990) to the construction of sophisticated empirical methodologies for detecting it across global markets (e.g. Chang et al., 2000; Chiang and Zheng, 2010). In addition, the table extends the exploration to more nuanced dimensions like multidimensional uncertainty (Avery and Zemsky, 1998), analyst career concerns (Hong et al., 2000), and institutional trading patterns (Kremer and Nautz, 2013). This illustrates the paradigm shift from

seeing herding as a simple anomaly to viewing it as a complex, context-dependent market mechanism. The systematic content analysis identifies the main theoretical pillars, methodological breakthroughs and empirical inconsistencies that have defined and progressed the discourse, giving a critical reference point for comprehending the trajectory of knowledge summarized in this review.

Table 2. Mapping research questions to methodological approaches and outcomes

Research question	Employed Methodologies	Analytical Tools and Software	Related Figure/ Table
RQ1: How has the concept of herding behavior in financial markets evolved over the past three decades, and what are the emerging theoretical and practical implications for policymakers, investors, and financial institutions?	Systematic Literature Review	Manual Review	Table 3, Figure 4
RQ2:What are the annual publication trends (1990–2025) and the key thematic evolutions reflected in author keywords in the herding behavior literature?	Bibliometric analysis	Python 3 / Bibliometrix (RStudio)	Figure 5, Figure 8
RQ3: How do multiple correspondence analysis (MCA) maps and three‑field plots (authors, journals, keywords) visualize the conceptual structure and actor interplay in herding behavior research, and how do these two complementary visualizations inform our understanding of the field's evolution?	Bibliometric analysis	Bibliometrix (RStudio)	Figure 6, Figure 12
RQ4:What insights do author keyword co‑occurrence analysis and reference co‑citation analysis provide regarding the thematic and conceptual development of the global herding behavior literature?	Bibliometric analysis	Bibliometrix (RStudio)	Figure 17, Figure 18
RQ5: How do the following aspects shape the social and intellectual structure of herding behavior research: (i) the top‑ten most productive and influential sources; (ii) the most cited countries (by corresponding authors and citation impact) and the global distribution of scientific output; (iii) global and regional collaboration networks along with the top‑ten most productive affiliations; and (iv) the most globally and locally cited documents?	Bibliometric analysis	Bibliometrix (RStudio)	Figure 14, Figure 15, Figure 9, Figure 10, Figure 11, Figure 18, Figure 16, Figure 19, Table 5,6,7

Figure 4 displays a composite timeline of the history of herding behavior methodology, illustrating the advancement from early cross-sectional measures in the 1990s to AI and network-based models in 2025. The idea of herding behavior in financial markets has developed from a static aggregate anomaly over three decades ago to a dynamic, multi-layered and context-dependent phenomenon. The first stage (1990s) provided basic cross-sectional measures for identifying herd patterns. Later, in the late 1990s and 2000s, new cross-sectional techniques were developed, which increased static analysis. In the late 2000s and 2010s, time-varying econometric models were introduced that acknowledged herding to be conditional on market states. In the late 2010s and 2020s, behavioral finance, microstructure theory and agent-based modeling were integrated to accommodate heterogeneous investor psychology and order-flow dynamics. AI, machine learning, and network-based models that use big data and complex systems theory to model high-frequency cascades and interconnected contagion risk define the current frontier, which is projected to last from the late 2020s to 2025. This evolution parallels the field's move from static, single-measure detection to an advanced, multi-faceted perception of herding as a complex adaptive process, driven by advancements in data availability, processing capacity, and multidisciplinary theoretical synthesis.

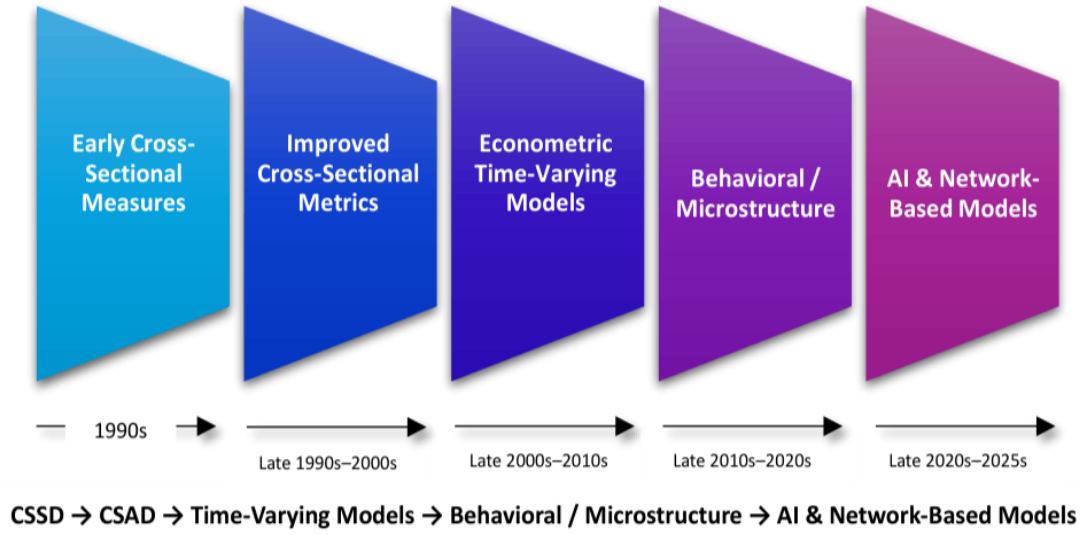


Figure 4. The methodological evolution of herding research (1990–2025)

This theoretical and methodological evolution carries profound emerging implications for key stakeholders. For policymakers, AI-enabled network models offer real-time systemic risk surveillance, allowing pre-emptive macroprudential interventions against herding-driven bubbles or flash crashes, but they also raise challenges in distinguishing rational information cascades from irrational panic. For investors, the shift toward behavioral microstructure implies that traditional momentum or contrarian strategies must now account for regime-dependent herding; machine learning signals can detect early herding phases, yet the very accessibility of such tools may trigger new forms of algorithmic herding. For financial institutions, the integration of network-based and AI models necessitates a re-engineering of risk management frameworks. Instead of assuming idiosyncratic noise, institutions must model interconnectedness and feedback loops across asset classes and trading venues while also confronting ethical and regulatory dilemmas around AI-induced herding in automated markets. Consequently, the theoretical trajectory from rational choice to complex adaptive systems directly reshapes practical decision-making, urging all stakeholders to move from reactive detection to proactive, data-driven governance of herding behavior.

4.3. Evolution and expansion of herding behavior research in financial markets

The annual evolution of scholarly output on herding behavior in financial markets between 1990 and 2025 is depicted in Figure 5, showing a marked general trend of long-term expansion with phases of acceleration and consolidation. The first stage of the literature (1990–1994) is characterized by very low academic activity, with the number of yearly publications ranging from one to three papers, indicating the embryonic nature of herding behavior as a distinct research issue in financial economics. Growth was slow in the mid to late 1990s, with production growing to eight products in 1995 and peaking at 10 in 1996, followed by minor variations in the early 2000s. There is a marked expansion after 2003, corresponding with increasing empirical interest in behavioral finance, as annual publications increase from 17 in 2003 to 24 in 2006 and reach 30 in 2008, a period closely related to heightened attention to market instability around the global financial crisis. The immediate post-crisis years saw a temporary decrease, but the trend is generally upwards: output increased steadily from 33 articles in 2011 to 40 in 2012 and has remained at high levels since.

Table 3. Content analysis using a structured framework for herding behavior in financial markets

Title, Authors & Year	Methodology Used	Key Findings	Relevant to Herding?	Citations
A Simple Model of Herd Behavior; Banerjee (1992)	The decision rules that are chosen by optimizing individuals will be characterized by herd behavior; i.e., people will be doing what others are doing rather than using their information. The resulting equilibrium is inefficient.	Banerjee analyzes a sequential decision model in which each decision maker looks at the decisions made by previous decision makers in taking her own decision.	✓	10770
Herd Behavior and Investment; Scharfstein and Stein (1990)	This paper examines some of the forces that can lead to herd behavior in investment.	Under certain circumstances, managers simply mimic the investment decisions of other managers, ignoring substantive private information. Although this behavior is inefficient from a social standpoint, it can be rational from the perspective of managers who are concerned about their reputations in the labor market. We discuss applications of the model to corporate investment, the stock market, and decision-making within firms.	✓	5941
Momentum Investment Strategies, Portfolio Performance, and Herding: A Study of Mutual Fund Behavior; Grinblatt et al (1995)	This study analyzes the extent to which mutual funds purchase stocks based on their past returns as well as their tendency to exhibit "herding" behavior (i.e., buying and selling the same stocks at the same time). The Momentum Measures and several other methods were used.	77 percent of the mutual funds were "momentum investors," buying stocks that were past winners; however, most did not systematically sell past losers. On average, funds that invested on momentum realized significantly better performance than other funds. We also find relatively weak evidence that funds tended to buy and sell the same stocks at the same time.	✓	3166

Note: Citation counts are a function of both scholarly impact and document age. Because older papers have been available for a longer period, they accumulate more citations purely as a result of time. Consequently, raw citation rankings are inherently biased toward earlier publications.
Source: Authors' findings

Table 3. (continued)

Title, Authors & Year	Methodology Used	Key Findings	Relevant to Herding?	Citations
An examination of herd behavior in equity markets: An international perspective; Chang et al. (2000)	They develop an empirical methodology to detect herd behavior in international equity markets, proposing an alternative, less stringent approach to Christie and Huang (1995) and comparing the two methods.	No herding in the US and Hong Kong, partial herding in Japan, and significant herding in South Korea and Taiwan. Results are robust across portfolios and time. Macroeconomic information has more impact than firm-specific information in herding markets. Security return dispersion increases more in up markets than down markets, consistent with directional asymmetry documented by McQueen et al. (1996).	✓	2275
Security Analysts' Career Concerns and Herding of Earnings Forecasts; Hong et al. (2000)	Analysts are ranked by their deviation from the consensus forecast for each firm-year, and a boldness score is constructed for each stock in an analyst' s coverage portfolio. The overall forecast boldness score is calculated as the average boldness over the current and previous two years, with higher values indicating bolder forecasts.	Inexperienced analysts are more likely to be terminated for inaccurate or bold forecasts that deviate from consensus. They deviate less from consensus, issue less timely forecasts, and revise forecasts more frequently. The results are broadly consistent with career-concern-motivated herding theories.	✓	1747
Herd Behaviour, Bubbles and Crashes; Lux (1995)	They formalize herd behavior in speculative markets, modeling bubbles as a self-organizing process of contagion among traders.	Speculators' tendency to follow the crowd depends on actual returns. Above-average returns foster optimism and herd-driven bubbles, which are transient and cause repeated fluctuations around fundamental values.	✓	1692

Note: Citation counts are a function of both scholarly impact and document age. Because older papers have been available for a longer period, they accumulate more citations purely as a result of time. Consequently, raw citation rankings are inherently biased toward earlier publications.
Source: Authors' findings

Table 3. (continued)

Title, Authors & Year	Methodology Used	Key Findings	Relevant to Herding?	Citations
Herd Behavior and Aggregate Fluctuations in Financial Markets; Cont and Bouchaud (2000)	They present a simple stock market model in which a random communication structure between agents generically produces heavy tails in stock price variations, in the form of an exponentially truncated power law, similar to those observed in recent high-frequency market data. The model explicitly links herding behavior among market participants to these statistical properties of returns.	The model connects two well-known market phenomena: heavy tails in stock market returns and herding behavior in financial markets. It highlights a relation between excess kurtosis in asset returns, market order flow, and the tendency of market participants to imitate each other.	✓	1260
Analyst Forecasts and Herding Behavior; Trueman (1994)	They examine the use of analyst forecasts as proxies for investors' earnings expectations, focusing on whether forecasts reflect analysts' private information accurately.	Analysts tend to release forecasts closer to prior earnings expectations than justified and exhibit herding by issuing forecasts similar to those of other analysts, even when not supported by their information. These findings have interesting empirical implications.	✓	1602
Multidimensional Uncertainty and Herd Behavior in Financial Markets; Avery and Zemsky (1998)	The study employs a theoretical analysis/model of financial markets to examine how different levels of uncertainty (dimensions of private information) influence the relationship between sequential trading, herd behavior, and asset price dynamics.	1 .With one dimension of uncertainty (effect of a shock), herd behavior is prevented by price adjustments. 2 .With two dimensions (existence and effect of a shock), herding arises but does not distort prices, as the market discounts the informativeness of trades during herding. 3. With a third dimension (quality of traders' information), herd behavior can cause significant short-run mispricing.	✓	1570

Note: Citation counts are a function of both scholarly impact and document age. Because older papers have been available for a longer period, they accumulate more citations purely as a result of time. Consequently, raw citation rankings are inherently biased toward earlier publications.
Source: Authors' findings

Table 3. (continued)

Title, Authors & Year	Methodology Used	Key Findings	Relevant to Herding?	Citations
An empirical analysis of herd behavior in global stock markets; Chiang and Zheng (2010)	They estimate herding behavior using a Newey–West consistent estimator (1987). The estimation is done twice: 1) first, imposing the restriction $\gamma_1 = 0$ consistent with CCK (2000); 2) second, relaxing the restriction $\gamma_1 = 0$. Results are grouped into Advanced, Latin American, and Asian markets.	Herding is found in advanced stock markets (except the US) and in Asian markets, but not in Latin American markets. US stock return dispersions influence non-US herding. Herding occurs in both up and down markets, with stronger asymmetry in rising Asian markets. Crises trigger herding and contagion effects, with supportive evidence of herding during crises in the US and Latin American markets.	✓	1361
Financial Analyst Characteristics and Herding Behavior in Forecasting; Clement and Tse (2005)	They classify analysts' earnings forecasts as herding or bold and examine the relationship of boldness with prior accuracy, brokerage size, experience, and number of industries followed.	Boldness increases with accuracy, brokerage size, and experience, and decreases with the number of industries followed. Bold forecasts are more accurate than herding forecasts. Herding forecast revisions are more strongly linked to forecast errors. Bold forecasts convey analysts' private information more fully and provide more relevant information to investors.	✓	1244
Security Analysis and Trading Patterns when Some Investors Receive Information Before Others; Hirshleifer et al. (1994)	The study employs a theoretical model to analyze trading behavior and equilibrium information acquisition in a financial market where the timing of private information receipt is sequential (some investors receive common information before others), unlike standard models where all are informed simultaneously.	1. Investors may herd, focusing only on a subset of securities while neglecting others with identical characteristics. 2. The model's predictions are consistent with empirical correlations suggestive of trading strategies like profit taking (short-term position reversal) and following the leader (mimicking earlier trades).	✓	1139

Note: Citation counts are a function of both scholarly impact and document age. Because older papers have been available for a longer period, they accumulate more citations purely as a result of time. Consequently, raw citation rankings are inherently biased toward earlier publications.
Source: Authors' findings

Table 3. (continued)

Title, Authors & Year	Methodology Used	Key Findings	Relevant to Herding?	Citations
Herd Behavior in a Laboratory Financial Market; Cipriani and Guarino (2005)	The study employs a laboratory financial market experiment. Participants (subjects) receive private information on an asset's fundamental value and engage in sequential trading with a market maker, who updates the asset price based on the trade history.	1. The main experimental result aligns with theoretical prediction: herd behavior is not observed among the trading subjects. 2. However, two phenomena not predicted by the theory are observed: -Subjects sometimes decide not to trade, choosing not to use their private information. -Subjects sometimes exhibit contrarian behavior, ignoring their private information to trade against the market trend.	✓	345
Causes and consequences of short-term institutional herding; Kremer and Nautz (2013)	The study conducts an empirical analysis using a comprehensive database of every transaction made by financial institutions in the German stock market. It employs panel regressions to investigate the causes and consequences of the observed herding.	1. Institutions exhibit daily herding behavior, with its intensity depending on stock characteristics like past returns and volatility. 2. Return reversals indicate herding has a short-term destabilizing impact on stock prices. 3. Herding is primarily unintentional and partly driven by the use of similar risk models by institutions. 4. The findings confirm the importance of macro-prudential aspects for banking regulation.	✓	267
Herding and information-based trading; Zhou and Lai (2009)	The analysis examines "sheeple" behavior by looking at individual trades, not net portfolio changes.	1. Existence of Herding: The study generally agrees with existing literature that herding is more prevalent with small stocks and during economic downturns, and is more likely when selling rather than buying. 2. Novel Propositions/Results: -Investors tend to herd more based on fundamental analysis than on technical analysis. -The results reveal the existence of informational cascades, highlighting the crucial role of "fashion leaders" (especially when more informed investors trade with " noise"). - Informational asymmetry can be identified by applying the informational cascade model to herding.	✓	265

Note: Citation counts are a function of both scholarly impact and document age. Because older papers have been available for a longer period, they accumulate more citations purely as a result of time. Consequently, raw citation rankings are inherently biased toward earlier publications.
Source: Authors' findings

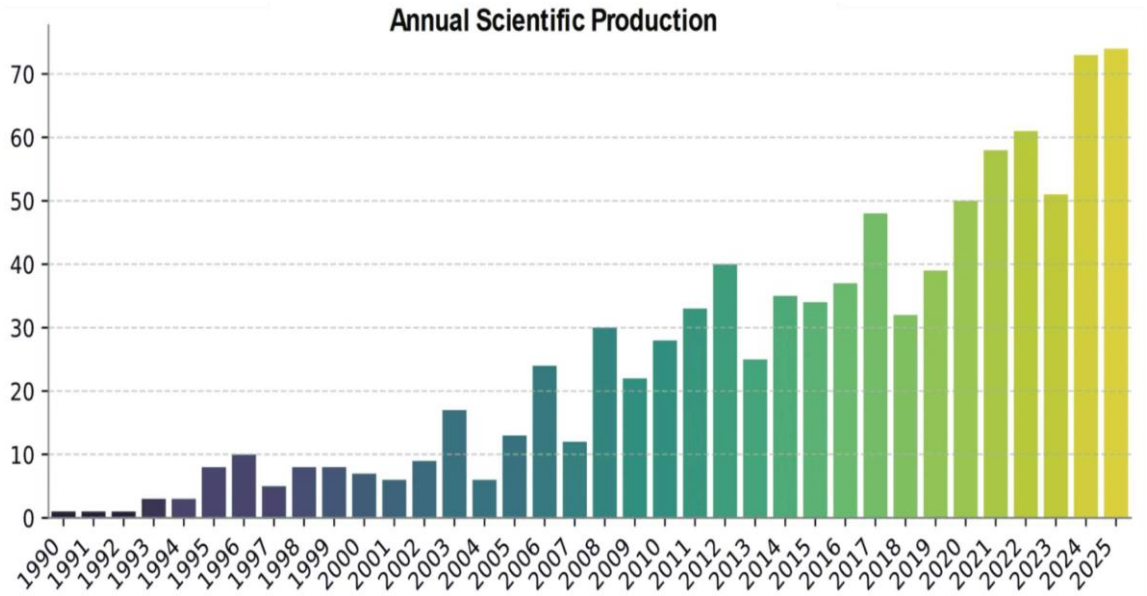


Figure 5. Annual trends in scientific output on herding behavior in financial markets

The largest increase occurred in the post-2017 period, where annual publications rose sharply from 48 in 2017 to 50 in 2020 and continued to accelerate to 58 in 2021 and 61 in 2022, culminating in a peak of 73 articles in 2024 and 74 in 2025. This ongoing growth suggests that herding is becoming a more consolidated research area, due to improvements in data availability, methodological sophistication and revived academic interest during bouts of extraordinary market volatility, such as the COVID-19 epidemic. Figure 5 shows the slow development and rising significance of research on herding behavior in the general literature of behavioral and financial economics.

4.4. Main information on the herding behavior research dataset

Table 4 shows that the 876 documents on herding behavior span 1990–2026, giving a total time span of 36 years. The document average age is 9.47 years, which places the mean publication year around 2016–2017. The average of 47.89 citations per document, compared to the average number of references per document (28,291 / 876 ≈ 32.30), yields a ratio of roughly 1.48 citations per reference. This positive ratio, together with the absolute citation value, suggests above-average scholarly impact. Nonetheless, citation distributions are likely skewed: a few highly cited papers may drive the mean upward, especially given that 169 single-authored documents (19.29% of all documents) – often associated with lower citation counts – coexist with the high overall average.

The international co-authorship rate stands at 33.08%. Internally, this rate is about 1.71 times higher than the proportion of single-authored documents (19.29%), not “nearly double”. Out of 1,956 distinct authors, only 159 have ever published alone, meaning that 91.9% of all authors participate exclusively in collaborative work. The average of 2.48 co-authors per document further supports a strong collaborative culture. Despite the frequent use of country-specific datasets in financial market research (e.g., data from a single stock exchange), the 33.08% rate indicates that a meaningful share of research involves cross-border teams, which can enhance methodological diversity and generalisability. Together, the data paint a consistent picture: herding behavior research appears impactful (high citations, favorable citation-to-reference ratio), longitudinally active, and substantially internationally integrated.

Table 4. Main information on herding behavior

Description	Results
Main Information About Data	
Timespan	1990:2026
Sources (Journals, Books, etc)	281
Documents	876
Document Average Age	9.47
Average citations per doc	47.89
References	28291
Document Contents	
Keywords Plus (ID)	1474
Author's Keywords (DE)	2128
AUTHORS	
Authors	1956
Authors of single-authored docs	159
Authors Collaboration	
Single-authored docs	169
Co-Authors per Doc	2.48
International co-authorships	33.08

4.5. Global structure and thematic connectivity of herding behavior research

Figure 6 presents a three-field plot linking authors' countries of affiliation (AU-CO), leading authors (AU), and core research themes derived from authors' keywords (DE), thereby illustrating the structural connections shaping herding behavior research in financial markets. The figure highlights the prominent role of countries such as China, the United States, the United Kingdom, Spain, and Germany as major contributors, reflecting the geographically concentrated yet internationally interconnected nature of the field. Influential authors such as Demirer and Kutan (2006), Fang et al. (2019), and Cipriani and Guarino (2005, 2014) are intellectual nodes connecting national research bases and thematic topics. On the thematic level, the knowledge structure is characterized by core concepts such as herding, herd behavior and herding behavior, while closely related topics such as informational cascades, behavioral finance, investor sentiment, market efficiency and financial crises underline the strong foundation of the field in behavioral and informational theories of market dynamics. The convergence of authors from different national contexts around a set of core concepts shows a high degree of intellectual cohesion, while the presence of themes related to emerging markets, social learning, and COVID-19 reflects the responsiveness of the field to changing market conditions and exogenous shocks. To put it simply, Figure 6 illustrates a mature and worldwide integrated research environment where scientists from different parts of the world contribute to a cohesive and growing body of information on herding behavior in financial markets.

4.6. Word cloud of core concepts in herding behavior research

To depict the conceptual landscape of herding behavior research, we offer a frequency-based representation of key phrases in Figure 7. This representation indicates the prominent theoretical bases and empirical emphases of the discipline. The high number of hits for herd behavior (399) and herding behavior (173) confirm that herding is the central organizing concept, while the occurrence of related terms such as herding (153), behavior (157), and impact (173) show that behavioral mechanisms and their impact on markets are still the focus of academic interest. The high number of phrases such as information (165), model (146) and performance (109) indicates a deep basis of the area in theories based on information and methods of quantitative modeling. Market (87), markets (58), financial markets (35), stock-market (53) and stock markets (30) are terms that clearly reveal

market-oriented dimensions. Outcome-related constructs such as volatility (83), returns (65), prices (58) and risk (67) also emerge, suggesting a consistent focus on the implications of herding for market efficiency and stability. The use of informational and behavioral mechanisms such as informational cascades (53), information cascades (29), investor sentiment (37), sentiment (36), contagion (34), and bubbles (34) shows the inclusion of behavioral finance aspects in the study of collective investor behavior. Furthermore, the presence of context-specific terms such as uncertainty (48), financial crisis (26), liquidity (26) and institutional investors (25) shows the sensitivity of the field to periods of market stress and varied investor structures. To put it simply, Figure 7 depicts a mature, multifaceted study area that combines informational, behavioral, and market-based approaches to clarify the dynamics and implications of herding in financial markets.

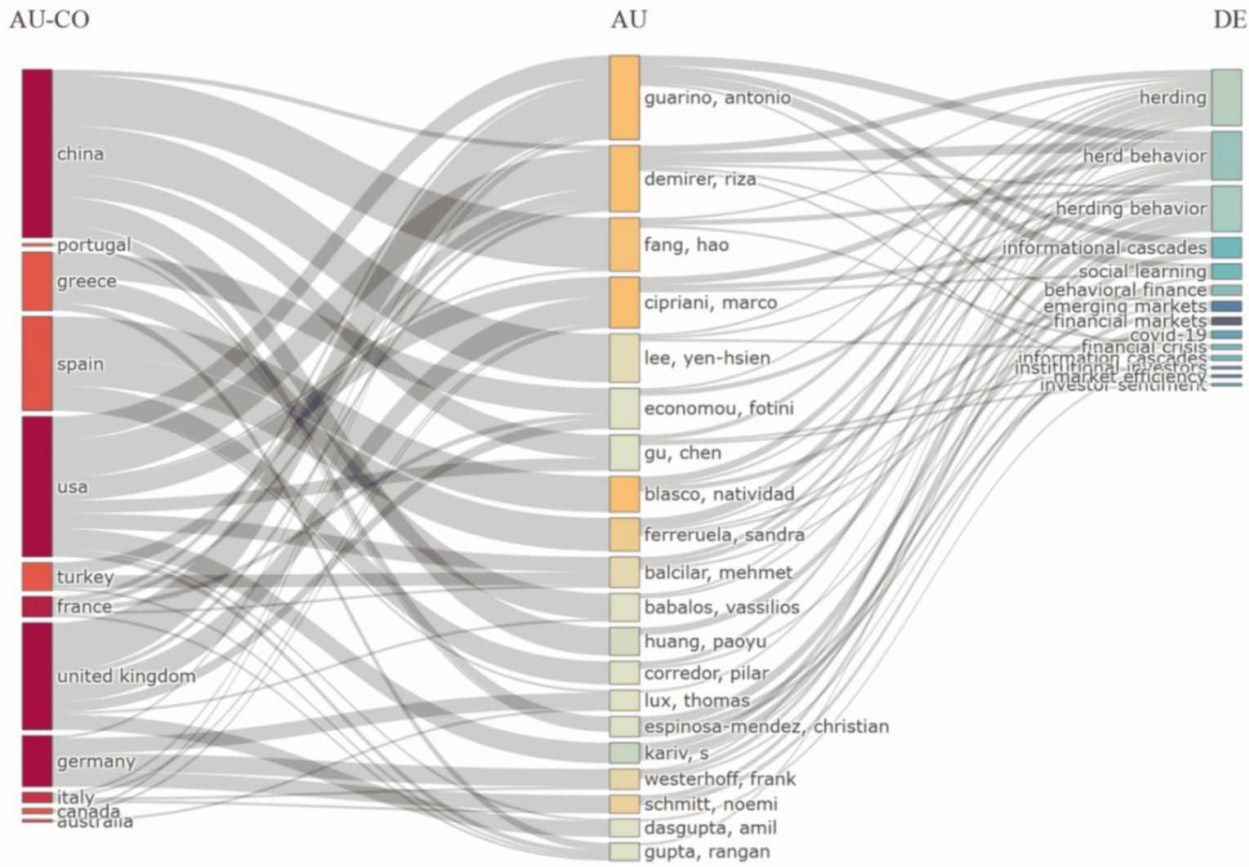


Figure 6. Three-Field plot of herding behavior in financial markets

4.7. Evolution of core themes in herding behavior research across time

The thematic evolution of herding behavior research is shown in Figure 8. It shows the transfer of dominating concepts from 1990-2017 to 2018-2026. From this, we can see the dynamic reconfiguration of the intellectual focus of the discipline over time. The previous period is rooted in the basic concepts of herding, herd behavior and herding behavior, which are strongly related to other broad issues such as financial markets, behavioral finance, institutional investors, bubbles, information and consumer behavior. This phase is characterized by a focus on the development of theoretical frameworks and empirical data explaining collective investor behavior, often in relation to market efficiency, informational asymmetries and speculative bubbles. Conversely, the later phase is characterized by significant topic diversification and conceptual refinement, with basic herding-related issues remaining, but more frequently intersecting with allied fields such as behavioral

economics, social learning and emotions. Such subjects as contagion, social media, stylized facts, and asset pricing have emerged, indicating a shift to microlevel behavioral dynamics, digital information channels and the transmission of attitudes in the modern financial markets. The continued presence of herding-related ideas in both periods suggests the theoretical resilience of the subject, while the transition to psychologically and technologically informed topics demonstrates an adaptive and forward-looking research agenda. In general, Fig. 8 illustrates the transition of herding research from the first market-based explanations to a more interdisciplinary methodology, integrating behavioral, social, and informational viewpoints to address shifting market structures and external shocks.



Figure 7. Word cloud (all keywords) of herding behavior

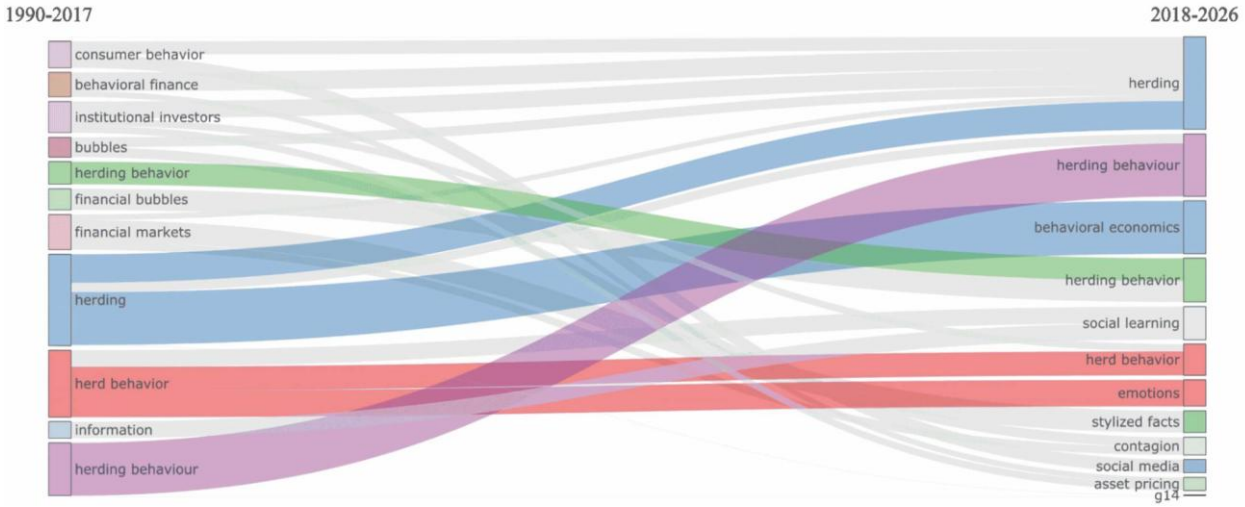


Figure 8. Thematic evolution of herding behavior in financial markets

4.8. Trend topics and the temporal evolution of herding behavior research

Figure 9 depicts the temporal dynamics of research topics in herding behavior studies by tracking the emergence, persistence, and transformation of authors' keywords over time. The early trend topics are mostly related to market microstructure and statistical properties of financial data, like feedback trading (Q1: 2005, median: 2008, Q3: 2009), fat tails (2007-2011), and volatility clustering (2007-2011). This indicates an initial interest in stylized empirical regularities of collective investor behavior. The early theoretical focus on information transmission, learning, and belief updating is

also reflected in the closely related informational themes of informational cascades (frequency: 19, Q1: 2007, median: 2009, Q3: 2014), informational cascade (2008–2018), information cascades (2009–2020), and reputation (2005–2013). The period was marked by a growing interest in the ideas of learning (2008–2013), information (2010–2016), and social learning (2011–2018), which suggest a slow transition from simply statistical descriptions to behavioral and informational explanations of herding phenomena. The increase in bubbles (2011-2022) and financial crises (2014-2019) also indicates the impact of macro-financial shocks on the research agenda in the post-global financial crisis period.

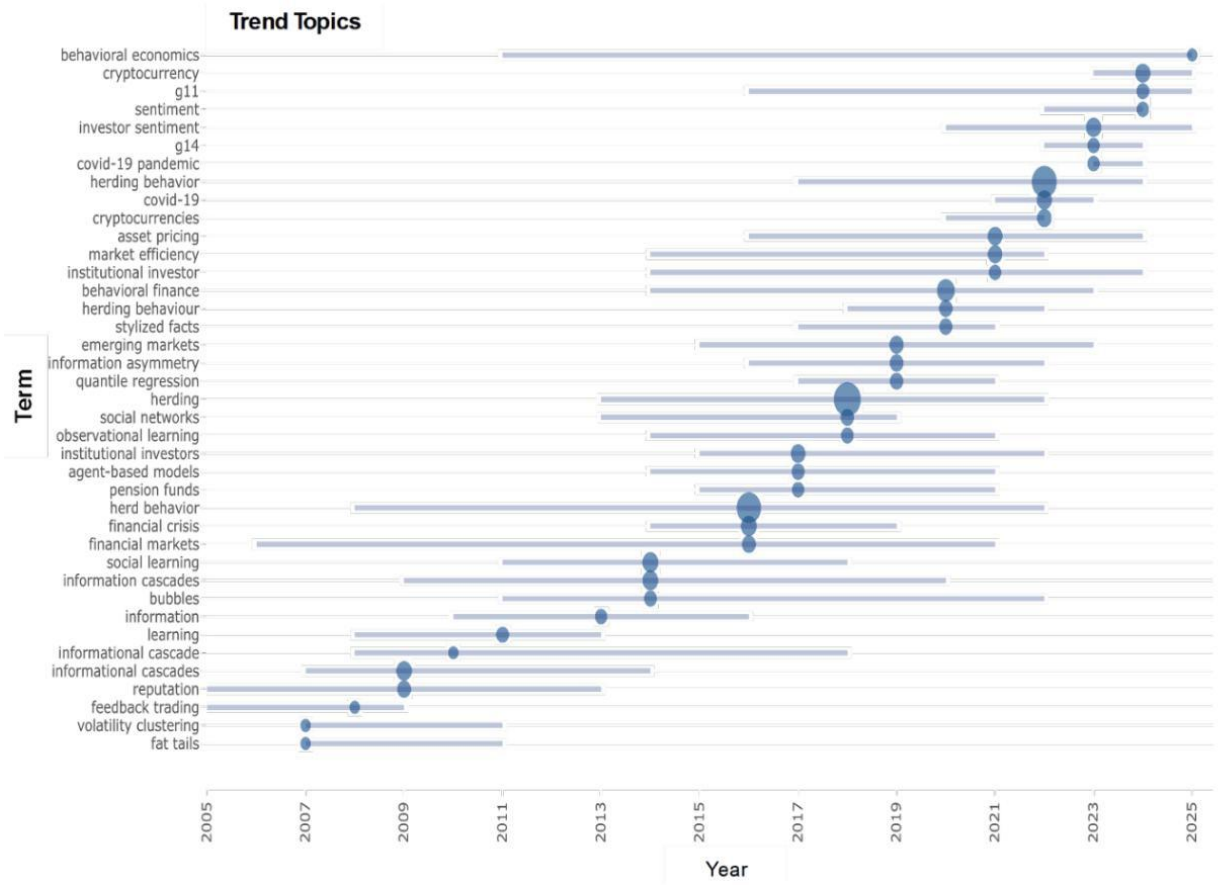


Figure 9. Trend topics (by author's keywords) in herding behavior in financial markets

In the more recent period, the thematic landscape expands and diversifies markedly, with a sustained rise in core herding-related concepts such as herd behavior (frequency: 110, median: 2016), herding (153, median: 2018), and herding behavior (120, median: 2022), signaling both conceptual consolidation and increased scholarly intensity. There is a growing methodological sophistication in agent-based models (2014–2021), quantile regression (2017–2021), and stylized facts (2017–2021), and market-structure topics such as institutional investors (2015–2022), pension funds (2015–2021), market efficiency (2014–2022), and asset pricing (2016–2024) indicate a greater integration of herding research into mainstream financial economics. The most recent trend themes show a clear reaction to structural and technical changes, as cryptocurrencies (2020–2022), cryptocurrency (2023–2025), investor sentiment (2020–2025), sentiment (2022–2024) and behavioral finance (2014–2023) have gained more importance. The emergence of COVID-19 (2021–2023) and the COVID-19 pandemic (2023–2024) illustrate the field's rapid response to unprecedented market disruptions, and

new topics such as behavioral economics (median: 2025), g11, and g14 suggest new ways of doing globally relevant and policy-relevant research. To summarize, Figure 9 depicts a clear transition from the early information-based and statistical analyzes to a matured interdisciplinary study agenda incorporating behavioral, institutional, technological, and crisis aspects of herding behavior in financial markets.

4.9. Top ten productive publication sources in herding behavior research

Figure 10 shows the distribution of academic production across the ten most productive publication channels on herding behavior in financial markets, and identifies the journals that have been the main forums for the development of this literature. The most productive source is Finance Research Letters, which published 45 articles, and shows its important role in publishing the relevant and empirically oriented research on behavioral phenomena in finance. The Journal of Behavioral Finance and the Journal of Economic Behavior & Organization are not far behind with 34 papers each. This is a testimony to the strong multidisciplinary basis of herding behavior research at the junction of behavioral economics, psychology, and financial markets. The prominence of these publications is indicative of the field's dependence on behavioral frameworks to explain collective investor dynamics and deviations from rational market behavior.

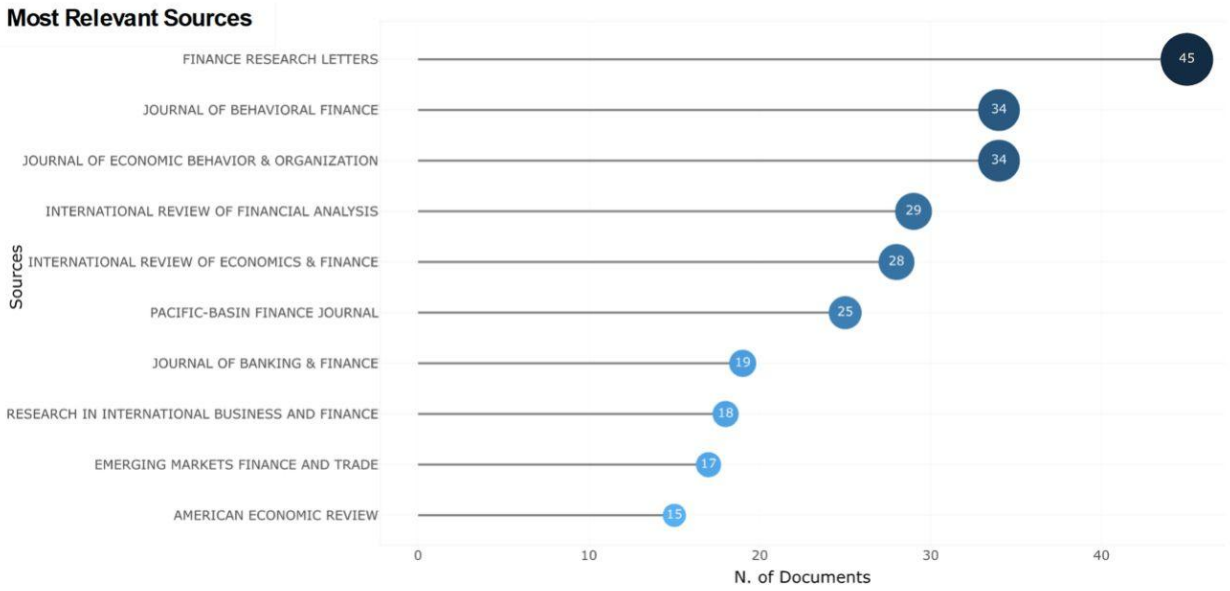


Figure 10. Top ten productive sources of publication on herding behavior in financial markets

Beyond these leading outlets, a second tier of highly relevant journals contributes substantially to the literature. The International Review of Financial Analysis and the International Review of Economics & Finance, respectively, contain 29 and 28 publications that indicate herding behavior remains relevant from an applied and international finance standpoint. Region- and market-specific journals, such as Pacific-Basin Finance Journal (25 articles) and Emerging Markets Finance and Trade (17 articles), reflect the rising significance of herding dynamics in emerging and Asia-Pacific markets, where information asymmetries and retail investor participation are often pronounced. Herding behavior studies are now part of mainstream financial economics and international business research, as shown by the fact that leading finance publications such as the Journal of Banking & Finance (19 articles) and Research in International Business and Finance (18 articles) have already

published articles on herding. Finally, the American Economic Review, with 15 articles, points out the theoretical importance of herding behavior as a central theme in economics, indicating its relevance not just to finance professionals but also to the wider economic discipline. The overall pattern in Figure 10 depicts a publication landscape of specialization and disciplinary breadth, with herding behavior research published across key behavioral, financial and economic journals.

4.10. Global citation impact of herding behavior research by country

Figure 11 shows the distribution of total citations across the most significant countries in herding behavior research, indicating substantial cross-national variations in academic impact. The United States has a considerable lead in citations with a total of 27,002 citations and a very high average of 116.40 citations per article, indicating that the United States has a prominent role in the generation of research that is highly important and widely cited. This prominent role is a reflection of the existence of premier academic institutions, early foundational contributions and a strong synergy between theoretical innovation and empirical application. China ranks second in total citations (2,697), but has a far lower average citation rate (15.50 per article), suggesting that the volume of publications is growing rapidly, and the citation impact is more recent or uneven. Germany, meanwhile, has a total of 2,667 citations and a much higher average of 44.50 citations per article, reflecting fewer but more consistently prominent contributions. The situation is similar for the United Kingdom, which has a balanced profile of constant output and moderate-to-high scholarly prominence: 2,204 citations and an average of 31.50 citations per piece.

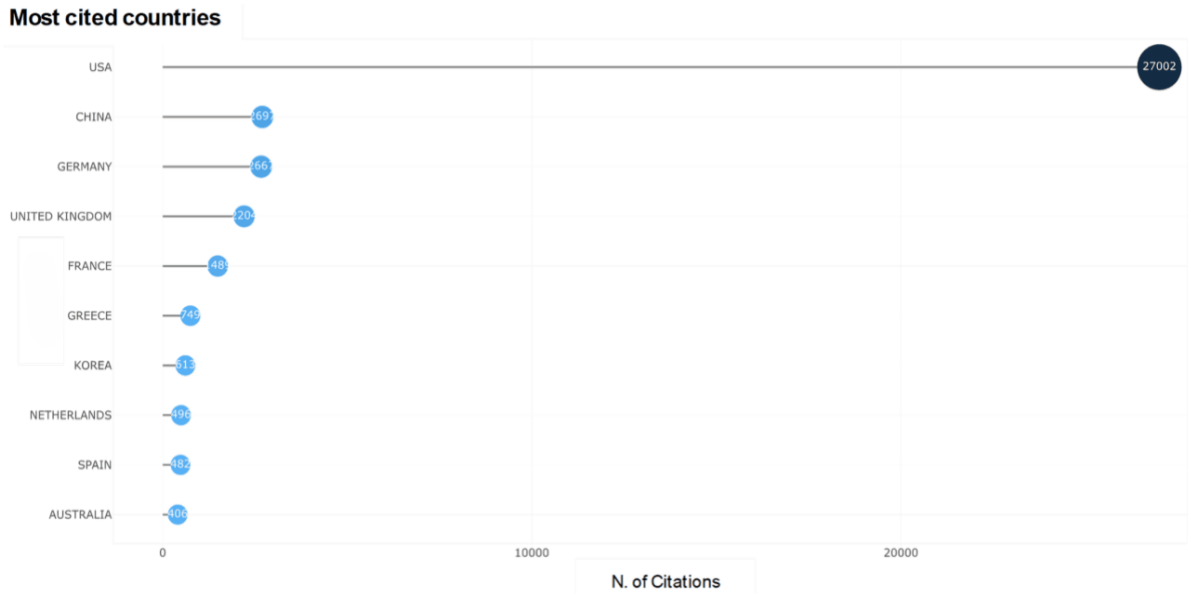


Figure 11. Most cited countries on herding behavior in financial markets

Beyond these leading contributors, several countries display notable citation efficiency relative to output size. The total number of citations for France is 1489, with a high average number of citations per article of 49.60. Greece, with a smaller body of research, has a total of 749 citations, with a strong average number of citations per article of 57.60, indicating a concentration of works with strong influence. South Korea has 613 citations with an average of 17.00, which shows a growing influence, but the Netherlands (496 citations, 27.60 average) and Spain (482 citations, 21.00 average) have modest citation activity, which shows constant scholarly involvement. Australia ranks in the tenth

position with a total of 406 citations and an average of 21.40 citations per article, which means Australia is present on the world stage but in a stable but lower position. The overall patterns in Figure 11 reveal a highly uneven global citation structure characterized by a small number of countries, particularly the United States, exerting disproportionate intellectual influence, while a handful of European countries achieve high citation intensity despite smaller publication volumes, collectively shaping the global impact of herding behavior research in financial markets.

4.11. Country-level output and collaboration in herding behavior research

Table 5 presents the top ten most relevant countries in herding behavior research based on the corresponding author's affiliation, offering insights into both publication volume and international collaboration patterns. The United States is the leading country with 232 articles (25.4%) and a strong dominance of single-country publications (171 SCP) and a significant number of multi-country publications (61 MCP), which yields an MCP share of 26.3% and shows a balanced but domestically anchored research structure. China is the second country with 174 papers (19.1%), showing a similar partnership profile with 125 SCP, 49 MCP, and an MCP rate of 28.2%, reflecting its quickly expanding and increasingly worldwide research presence. European countries show a much higher degree of cross-border collaboration, especially the United Kingdom with a much lower output of 70 articles (7.7%), but a high MCP share of 44.3%, and France, where half of the publications (15 out of 30) are internationally co-authored with an MCP rate of 50%. Similar collaboration-intensive patterns are evident for the Netherlands (50% MCP), Korea (41.7%) and Australia (42.1%), demonstrating the essential relevance of international networks in these research groups. Japan, however, has a more home-oriented publication profile, with 26 SCP and only 4 MCP, leading to a comparatively low share of 13.3% of MCP. Overall, the distribution captured in Table 5 reveals a heterogeneous global research landscape in which high-output countries combine scale with moderate internationalization, while smaller research systems tend to rely more heavily on cross-national collaboration, collectively shaping the global production of knowledge on herding behavior in financial markets.

Table 5. Top ten most relevant countries by corresponding author in herding behavior research

Country	Articles	Articles %	SCP	MCP	MCP %
Usa	232	25.400	171	61	26.300
China	174	19.100	125	49	28.200
United Kingdom	70	7.700	39	31	44.300
Germany	60	6.600	41	19	31.700
Korea	36	3.900	21	15	41.700
France	30	3.300	15	15	50.000
Japan	30	3.300	26	4	13.300
Spain	23	2.500	19	4	17.400
Australia	19	2.100	11	8	42.100
Netherlands	18	2	9	9	50

4.12. Evolution of herding behavior in financial markets

Figure 12 presents a Multiple Correspondence Analysis (MCA) conceptual structure map derived from bibliographic data on herding behavior in financial markets (1990–2025). To eliminate any ambiguity without direct access to the figure, all concepts are precisely assigned to their exact quadrants based on the Dim 1 (22.82%) and Dim 2 (16.39%) coordinates. The upper-left quadrant (Dim 1 negative, Dim 2 positive) clusters bitcoin, cryptocurrencies, investor sentiment, COVID-19, market efficiency, bubbles, sentiment, herding behavior, and behavioral finance. This configuration reveals that digital assets and exogenous shocks (e.g., the pandemic) have recently become central to

herding research, but crucially, they are not studied in isolation. The tight spatial proximity of "bitcoin" and "cryptocurrencies" to "investor sentiment" and "behavioral finance" demonstrates that the field has absorbed these new phenomena into a pre-existing psychological framework: herding in crypto markets is understood as an extension of classical behavioral biases (overconfidence, fear of missing out, regret aversion) rather than as a purely technical or efficient-market phenomenon. Moreover, the co-location of "COVID-19" with "bubbles" and "market efficiency" indicates that pandemic-induced uncertainty has been theorized as a catalyst for speculative bubbles and a temporary breakdown of market efficiency, where herding behavior amplifies price deviations. The upper-right quadrant (Dim 1 positive, Dim 2 positive) contains information aggregation, social network, imitation, herd behavior, informational cascade, social learning, and experiment. Unlike the upper-left quadrant's focus on psychological dispositions, this cluster emphasizes mechanisms of social transmission. The adjacency of "information aggregation" to "social network" and "informational cascade" shows that herding is not merely an individual bias but a collective outcome of how information flows through networked structures. "Imitation" and "social learning" appear as distinct processes: imitation is a simple copying behavior, whereas social learning implies updating beliefs based on observed outcomes of others. The presence of "experiment" is particularly telling; it signals that researchers have moved beyond correlational studies to controlled laboratory and online experiments that manipulate network topology, information signals, and payoff structures to isolate causal mechanisms of herding.

Moving to the lower-right quadrant (Dim 1 positive, Dim 2 negative): Information asymmetry, financial analysts, systemic risk, agent-based models, and stylized facts. This cluster reveals a methodological and systemic perspective. "Information asymmetry" and "financial analysts" are conceptually linked because analysts often possess private information, and their herding on each other's recommendations can exacerbate information cascades. "Systemic risk" appears in the same quadrant, indicating that herding behavior is now recognized as a micro-foundation of macro-financial instability. The inclusion of "agent-based models" (ABMs) and "stylized facts" is highly significant: ABMs simulate heterogeneous interacting agents (e.g., noise traders, fundamentalists, chartists) and reproduce stylized facts (fat tails, volatility clustering, power-law correlations). Their spatial proximity to "systemic risk" suggests that computational modeling has become the dominant toolkit for understanding how local herding rules generate global systemic fragility. Finally, the lower-left quadrant (Dim 1 negative, Dim 2 negative) comprises stock market, emerging market, g11, institutional investors, g14, pension funds, financial crisis, COVID-19 pandemic, and herding behavior. Notably, "herding behavior" appears both here and in the top-left quadrant, reflecting its bridging role. This quadrant focuses on macro-institutional actors and crisis contexts. "Institutional investors" (mutual funds, pension funds, hedge funds) and groupings (g11, g14) are placed close to "financial crisis" and "emerging market", indicating that herding among large players is a key transmission channel of crises, especially in less-developed financial systems.

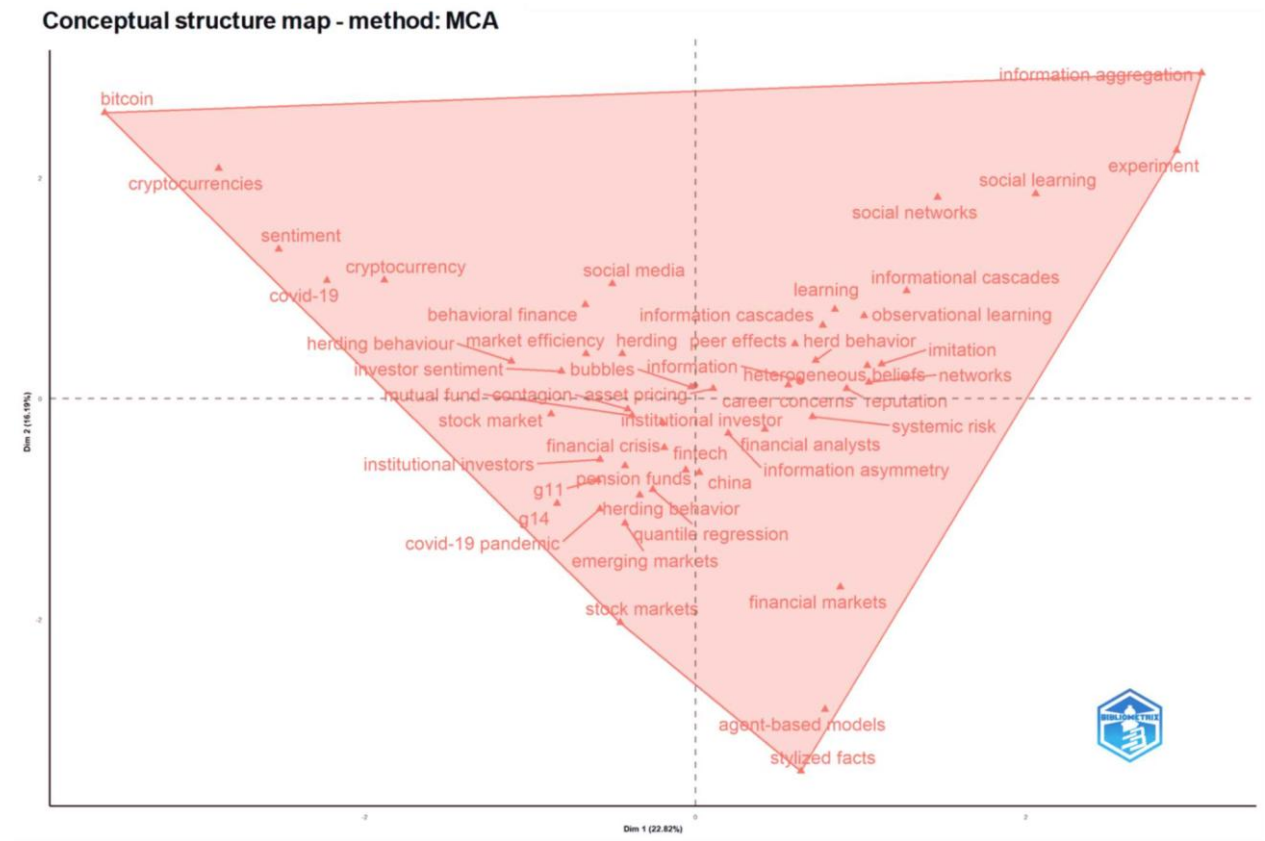


Figure 12. MCA conceptual map of herding behavior in financial markets

4.13. Top ten authors' publication trajectories in herding behavior research

Figure 13 traces the temporal evolution of scientific production by the ten most prolific authors in herding behavior research, revealing distinct patterns of sustained contribution, episodic productivity, and thematic continuity over time. Long-standing and seminal authors such as Cipriani and Guarino (2005, 2014) have been publishing since the late 2000s, demonstrating their essential role in creating and developing theoretical and experimental approaches to herding behavior. The case of Demirer and Kutan (2006) is remarkable for the consistency and intensity of output, with marked peaks in the mid-2010s which correlate with increased academic interest in market instability and behavioral reactions. Authors such as Blasco, Natividad and Ferreruela, Sandra are characterized by a consistent dedication to the subject across time, which indicates ongoing study programs instead of individual contributions. An important increase of the productivity of the authors is observed after 2014. Fang, Hao, Lee, Yen-Hsien and Balcilar, Mehmet show concentrated periods of output coinciding with the increasing application of herding concepts to emerging markets, volatility dynamics and cross-sectional asset pricing. More recent entrants such as Schmitt, Noemi and Westerhoff, Frank display increasing productivity in the post-2015 period, reflecting the field's openness to new methodological perspectives, including nonlinear dynamics and agent-based modeling. Overall, the temporal patterns depicted in Figure 13 highlight a balance between intellectual continuity and renewal, illustrating how a core group of authors has shaped the long-term development of herding behavior research while successive cohorts have expanded its scope in response to evolving financial environments and research frontiers.

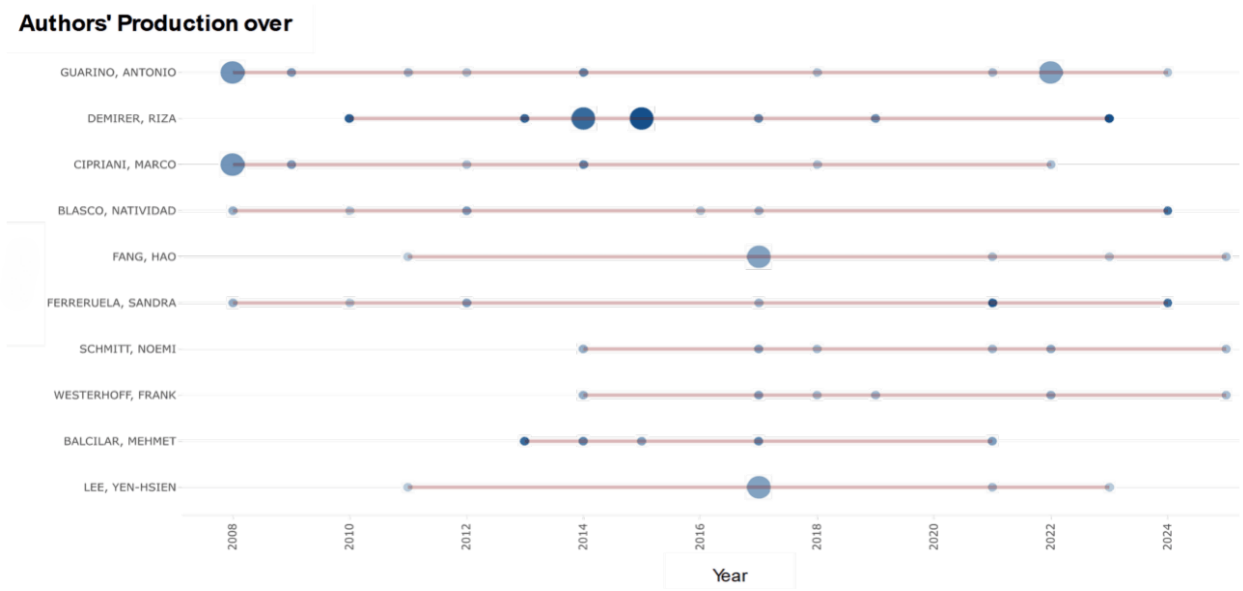


Figure 13. Top ten authors' production over time on herding behavior in financial markets

Note: The figure spans the full 1990–2025 period. Clustering of publications in specific sub-periods (e.g., late 2000s, post-2014) reflects authors' actual activity timelines, not a truncated analysis. Every active year for each author is plotted, ensuring full temporal representation.

4.14. Top ten authors and local scholarly impact in herding behavior research

Table 6 reports the top ten authors in terms of local scholarly impact within the herding behavior literature, and to ensure full transparency and reproducibility, all metrics are computed on a strictly defined local citation network. The corpus comprises all peer-reviewed documents in the Web of Science Core Collection on herding behavior in financial markets. A local citation counts only citations exchanged between documents within this curated set; cross-field citations are excluded. Consequently, each metric in Table 6 – total local citations (TC), number of publications (NP), publication start year (PY-start), local h-index, local g-index, and local m-index – is derived solely from this internal citation backbone. The local h-index is the largest integer *h* such that *h* of an author's publications each have received at least *h* local citations. The local g-index is the highest integer *g* for which the top *g* publications (ranked by local citations) together accumulate at least $*g*^2$ local citations, capturing both breadth and citation intensity. The local m-index normalises the local h-index by career length: m = h / (current year – PY-start + 1), where the current year is the year of data extraction. These definitions are applied algorithmically, allowing any reader to replicate the indices from the same local citation matrix.

Applying these transparent criteria to Table 6 reveals nuanced impact profiles. Demirer and Kutan's (2006) identical h = 9 and g = 9 indicate balanced impact across all his papers, with no single subset dominating. Guarino Antonio's g (11) exceeding his h (7) signals concentrated, high-intensity influence from a few publications. The m-index corrects for career length: Schmitt Noemi and Westerhoff Frank (both PY-start 2014) achieve m = 0.417, reflecting rapid local recognition, whereas Lux (PY-start 1995) has the same h = 5 but a lower m = 0.263 due to a longer career. Thus, every value in Table 6 is traceable to a rule-based calculation on a field-specific citation graph.

Table 6. Top ten authors' local impact on herding behavior in financial markets

Author	h-index	g-index	m-index	TC	NP	PY-start
Demirer Riza	9	9	0.563	631	9	2010
Guarino Antonio	7	11	0.389	297	11	2008
Cipriani Marco	6	7	0.333	251	7	2008
Balcilar Mehmet	5	5	0.385	310	5	2013
Ferreruela Sandra	5	6	0.278	186	6	2008
Lux Thomas	5	5	0.263	334	5	2007
Schmitt Noemi	5	6	0.417	89	6	2014
Westerhoff Frank	5	6	0.417	92	6	2014
Babalos Vassilios	4	4	0.308	205	4	2013
Blasco Natividad	4	6	0.222	137	6	2008

To enable a precise, field-delimited assessment, all metrics in Table 6 are computed on a local citation network: the corpus comprises all peer-reviewed documents in Web of Science Core Collection on herding behavior in financial markets. Local citations (TC) count only citations exchanged within this curated set, eliminating cross-field noise. The local h-index is the largest *h* such that *h* publications have each received ≥ *h* local citations; the local g-index is the highest *g* where the top *g* publications collectively receive ≥ g^2 local citations, capturing both breadth and intensity. The m-index normalises local h by career length (years since PY-start). These specifications reveal nuanced profiles: Demirer and Kutan's (2006) identical h and g (both 9) show balanced impact across all his papers; Guarino Antonio's g (11) > h (7) signals concentrated, high-intensity influence from a subset of his work; and Schmitt Noemi's high m-index (0.417) reflects rapid local recognition despite a shorter career. By reporting local TC, NP, PY-start, and these three complementary indices – each derived from a transparent, reproducible, field-specific citation backbone.

4.15. Researcher collaboration network in herding behavior

Figure 14 illustrates the collaboration network among researchers studying herding behavior in financial markets, highlighting the interconnectedness and contributions of various scholars to the field. The network consists of separate clusters of scholars and central individuals like Demirer and Kutan (2006) are key contributors, as demonstrated by their larger nodes and multiple collaborations. These researchers have a large impact as they are associated with multiple other researchers in the network, showing their crucial involvement in the development of information regarding herding behavior. Moreover, there are several smaller clusters in the network; for example, the green cluster containing Blasco, Natividad, and Ferreruela, Sandra, which indicates an eclectic mix of study interests within the larger topic. Researchers such as Ziegelmeyer, Anthony and Koessler, Frederic, found that isolated clusters are representative of specific subfields or developing fields of research. The global dimension of the study is also evident in the geographical diversity of the network, with experts from diverse institutions across the world contributing to the growth of this field of financial market behavior. Overall, the network highlights the collaborative nature of herding behavior research, with significant academics making major contributions, and smaller interconnected clusters pushing the limits of the discipline.

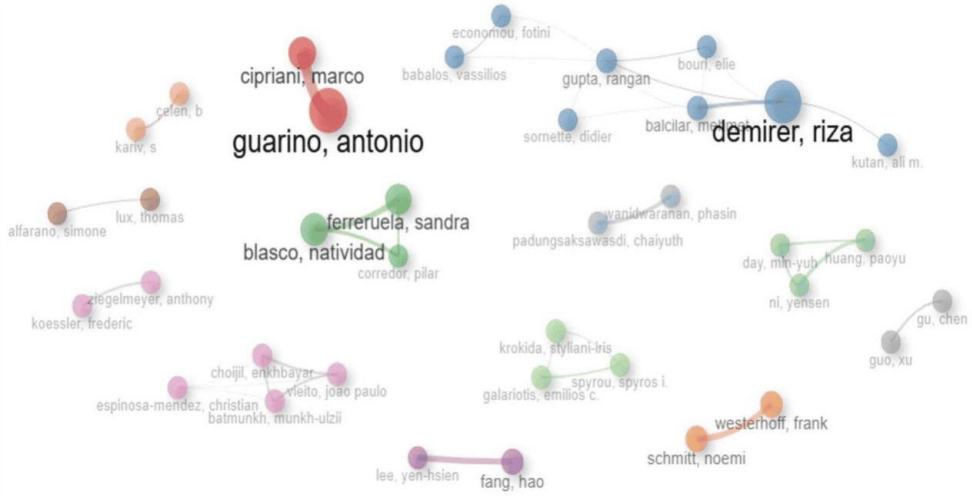


Figure 14. Researcher collaboration network

4.16. Top ten most productive affiliations in herding behavior research

Figure 15 presents the institutional distribution of scholarly output in herding behavior research within financial markets, based strictly on the volume of publications as a quantitative indicator of research activity. By this measure, the University of London ranks first with 48 articles, reflecting its substantial engagement in behavioral and financial economics. In the underlying dataset, each institutional affiliation was coded exactly as reported by the authors; thus, articles affiliated with "University of London" are treated separately from those affiliated with "University College London" (UCL) or the "London School of Economics and Political Science" (LSE).

Subject to this methodological qualification, the University of California System follows with 26 publications, and University College London with 22 articles. The University of Oxford contributes 15 articles, the Federal Reserve System (USA) 14 articles, the National Bureau of Economic Research 13 articles, the University of Texas System 13 articles, the University System of Georgia 13 articles, Harvard University 12 articles, and the London School of Economics and Political Science 12 articles. The presence of policy-oriented institutions such as the Federal Reserve and NBER underscores the relevance of herding behavior research for monetary policy, financial regulation, and macro-financial stability. Overall, the landscape depicted in Figure 15 is characterized by a concentration of productivity among a limited set of elite research universities and large public university systems, alongside influential policy-organizations. This institutional diversity, interpreted with the above caveat regarding nested affiliations, provides a robust empirical basis for understanding which organizational contexts have most actively shaped the theoretical, empirical, and applied dimensions of herding behavior research in financial markets.

4.17. Top ten most influential globally cited studies in herding behavior research

In Table 7, we report the ten most internationally cited articles in the herding behavior literature. These are the seminal works that have had the strongest and longest-lasting effect on financial economics. The most prominent contribution is the study by Banerjee (1992) with a total of 10,770 citations and a high and persistent average of 336.56 citations per year, highlighting the fundamental role of herding and informational cascade models. The second most cited paper was by Scharfstein and Stein (1990) with 5941 citations, or 174.74 citations per year, which also emphasizes the relevance of reputational and agency-based explanations of herding behavior. Grinblatt et al. (1995) has 3,166 citations and a normalized citation score of 0.98 and Chang et al. (2000) has 2,275 citations,

which is still important with 94.79 citations per year. The theoretical and agent-based approaches are represented by Lux (1995) (1,692 citations) and Cont and Bouchaud (2000) (1,260 citations), with normalized citation performances of 0.53 and 0.47, respectively, suggesting lasting significance. Similarly, the multidimensional uncertainty model by Avery and Zemsky (1998) has been cited 1,570 times and Hong et al. (2000) have been cited 1,747 times. Recent contributions like Chiang and Zheng (2010) have a substantial effect in contemporary work with 1,361 citations and a normalized citation score of 0.88. Lastly, Trueman (1994), with 1,602 citations, shows the ongoing significance of information disclosure and market expectations in herding-related research. In conclusion, the citation patterns in Table 7 suggest a very coherent global knowledge base, where early theoretical breakthroughs and later empirical innovations together form the intellectual backbone of research on herding behavior in financial markets.

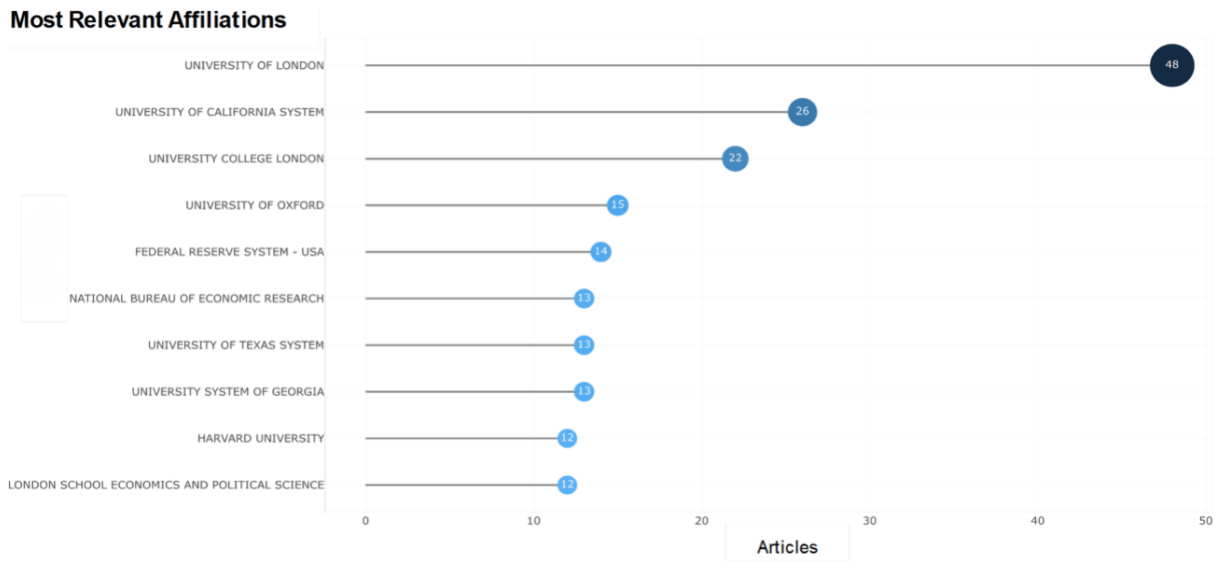


Figure 15. Top ten most productive affiliations in herding behavior research in financial markets

4.18. Most local references in herding behavior research

Figure 16 identifies the ten most locally cited references that constitute the intellectual foundations of herding behavior research in financial markets, highlighting a set of seminal contributions that have profoundly shaped the field's theoretical and empirical development. The most influential work is Banerjee (1992, Quarterly Journal of Economics) with 388 local citations, followed closely by Bikhchandani et al. (1992, Journal of Political Economy) with 377 citations; both papers introduced formal models of herd behavior and informational cascades that are central to contemporary research. Third is Scharfstein and Stein (1990, American Economic Review) with 323 citations, demonstrating the lasting appeal of reputational and agency-based theories of herding by managers and investors. Prominent examples of empirical studies on market-level herding are Chang et al. (2000, Journal of Banking & Finance, 208 citations) and Lakonishok et al. (1992, Journal of Financial Economics, 197 citations) that supplied widely adopted methodologies to measure herding in financial markets. Other influential contributions include Christie and Huang (1995, Financial Analysts Journal, 189 citations), Bikhchandani and Sharma (2000, IMF Staff Papers, 178 citations), Chiang and Zheng (2010, Journal of Banking & Finance, 145 citations), Wermers (1999, Journal of Finance, 144 citations) and Avery and Zemsky (1998, American Economic Review, 139 citations), which together offer a mixture of theoretical modeling, empirical testing and institutional perspectives. The clustering of local citations

around these landmark studies is suggestive of a very coherent intellectual core, in which early theoretical insights and methodological innovations continue to support and drive the development of herding behavior research within financial economics.

Table 7. Top ten most globally cited documents on herding behavior in financial markets

Paper	DOI	Total Citations	TC per Year	Normalized TC
Banerjee (1992)	https://doi.org/10.2307/2118364	10770	336.560	3.030
Scharfstein and Stein (1990)	https://www.jstor.org/stable/2006678	5941	174.740	1.570
Grinblatt et al. (1995)	http://www.jstor.org/stable/2950976	3166	109.170	0.980
Chang et al. (2000)	https://doi.org/10.1016/S0378-4266(99)00096-5	2275	94.790	0.850
Lux (1995)	https://doi.org/10.2307/2235156	1692	58.340	0.530
Hong et al. (2000)	https://doi.org/10.2307/2601032	1747	72.790	0.660
Trueman (1994)	https://doi.org/10.1093/rfs/7.1.97	1602	53.400	0.480
Avery and Zemsky (1998)	https://www.jstor.org/stable/117003	1570	60.380	0.540
Chiang and Zheng (2010)	https://doi.org/10.1016/j.jbankfin.2009.12.014	1361	97.210	0.880
Cont and Bouchaud (2000)	https://doi.org/10.1017/S1365100500015029	1260	52.500	0.470

Note: To remove the confounding effect of publication age, two normalisation metrics are provided: citations per year (annual citation rate) and field‐normalised citation score. These metrics enable a fair comparison of citation impact across documents published in different years, ensuring that recent contributions are not systematically disadvantaged.

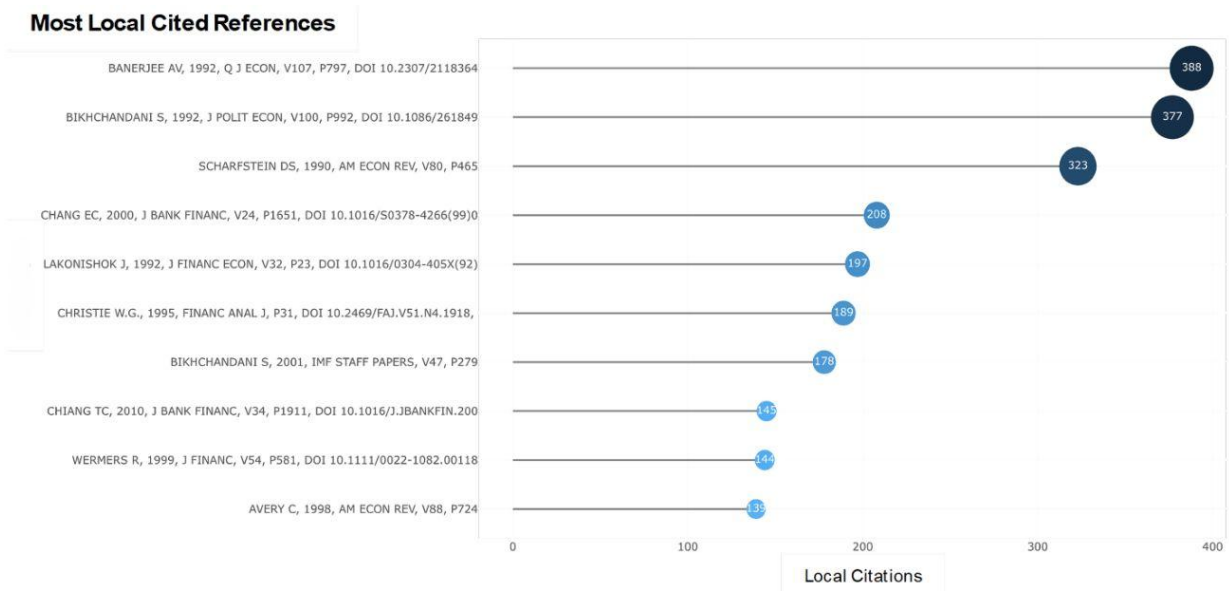


Figure 16. Top ten most locally cited references on herding behavior in financial markets

4.19. Keyword co-occurrence structure of herding behavior research

Figure 17 presents the co-occurrence network of authors' keywords, revealing the conceptual structure and thematic interconnections underlying the global literature on herding behavior in financial markets. The network shows herding behavior, herd behavior and herding as central and

heavily connected nodes, validating their position as the main conceptual anchors of the field. Clusters closely related to the main streams of research emerge around these dominant terms. These include information-based mechanisms such as informational cascades, information asymmetry and social learning, and outcome-oriented topics related to volatility, returns, risk and market efficiency. The high co-occurrence of herding-related concepts and behavioral constructs such as investor sentiment, behavioral finance, and emotions points to the inclusion of psychological viewpoints in the understanding of collective investor behavior. Moreover, the prominence of clusters related to financial crises, bubbles, asset pricing, and institutional investors suggests an increasing focus on systemic implications of herding in diverse market conditions and among different categories of investors. In general, the strong connectedness and evident thematic clustering in Figure 17 show that the study field is mature and well integrated, with informational, behavioral and market perspectives coming together to offer a full picture of herding behavior in financial markets.

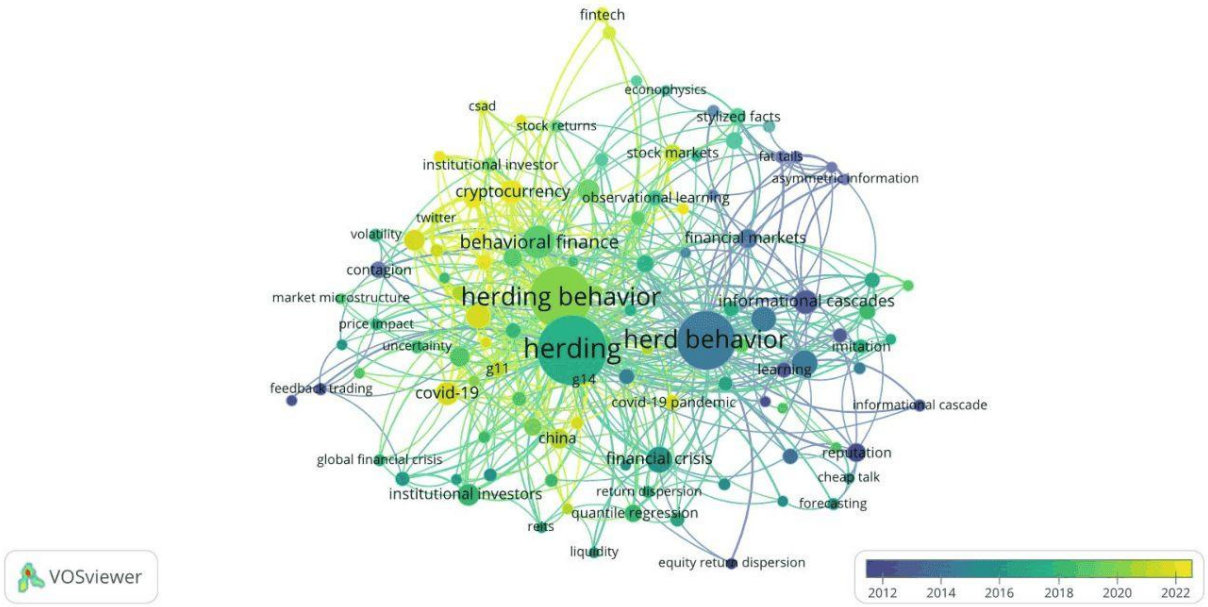


Figure 17. Co-occurrence analysis of author keywords in the global herding behavior literature

4.20. Intellectual structure of herding behavior research based on co-citation analysis

Figure 18 presents the co-citation network of references in the global literature on herding behavior in financial markets, revealing the deep intellectual structure and foundational knowledge clusters that underpin the field. The network breaks into multiple densely connected citation clusters, corresponding to diverse but related theoretical and empirical traditions. The network is based on seminal theoretical contributions on informational cascades, reputation effects and social learning, emphasizing the significance of these concepts and their influence on following research trajectories. These foundations are closely related to clusters studying empirical measurement of herding, market efficiency and asset pricing, showing how theoretical ideas have been turned into valid empirical frameworks. The substantial interlinkages between references show a high level of intellectual cohesiveness and frequent co-citation, which indicate the fact that the research share a conceptual underpinning and methodological alignment. Peripheral, but more connected, clusters capture more recent breakthroughs such as agent-based modeling, behavioral finance, and crisis-related research, highlighting the field's ability to adopt new approaches and adapt to altering market situations. To summarize, the research on herding behavior is grounded in a stable core of influential references,

and yet, as shown in Figure 18, it also evolves by incorporating interdisciplinary perspectives, which is indicative of a mature, cumulative and dynamically expanding body of knowledge in financial economics.

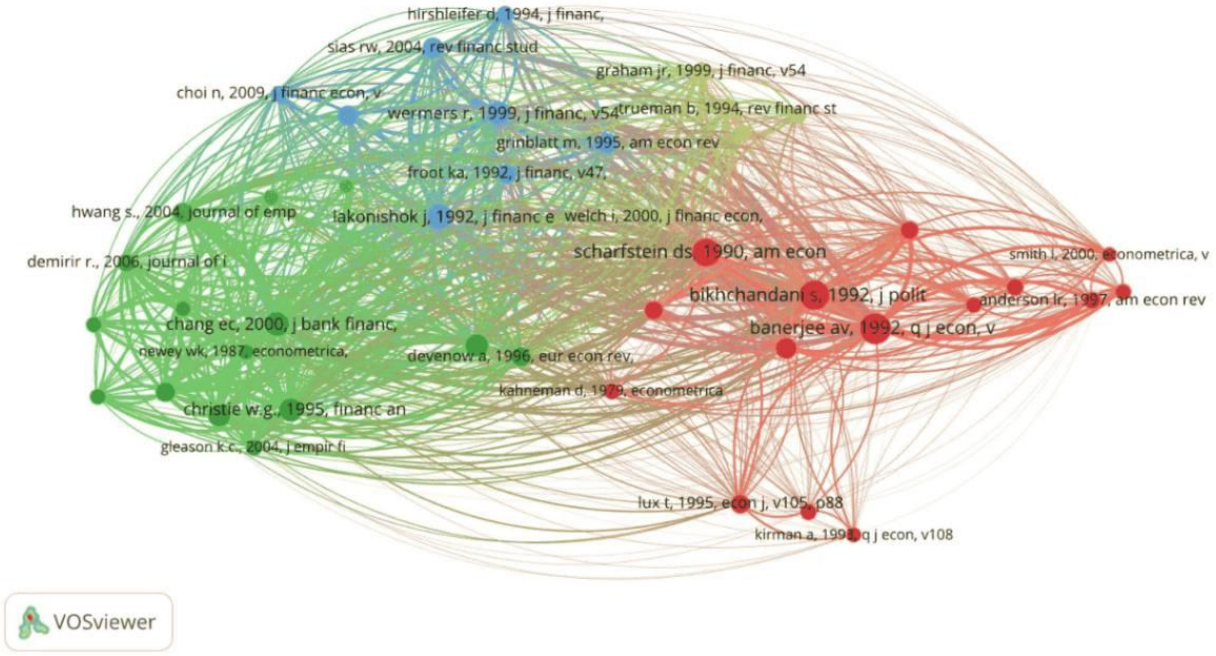


Figure 18. Co-citation analysis of references in the global herding behavior literature

4.21. Global distribution of scientific production on herding behavior research

Figure 19 illustrates the global distribution of scientific production on herding behavior in financial markets, revealing a highly concentrated yet internationally diversified research landscape. The most prolific country is the United States with 475 articles, followed by China (426), showing the substantial influence of these two countries on the present state of study on herding behavior. This dominance is a reflection of the size of their academic systems and the relevance of herding-related phenomena in big and increasingly complex financial markets. The United Kingdom (172) and Germany (103) are key hubs of scholarly output, followed by France (87), Italy (56), Spain (50), and the Netherlands (45), suggesting a strong and ongoing involvement across several research traditions. European countries also play a significant role. In East Asia, South Korea (61) and Japan (56) contribute significantly, demonstrating the increasing importance of herding behavior research in marketplaces with large retail involvement and quick information diffusion. Figure 19, taken in its entirety, reveals a globalized but uneven research pattern with output clustered in a limited number of developed and developing countries, indicating that national market characteristics, institutional capacity and exposure to market volatility are important factors for the scholarly interest in herding behavior.

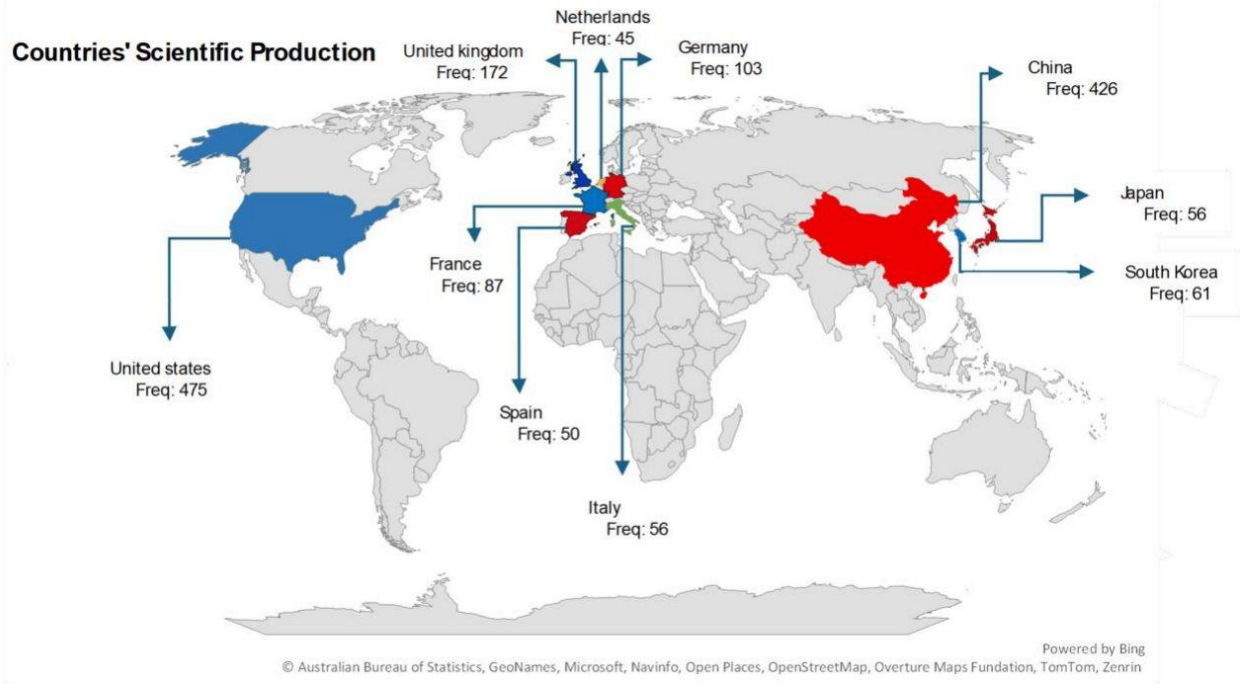


Figure 19. Country-level production of herding behavior research in financial markets
Source: Map designed by the authors**.** Powered by Bing © Australian Bureau of Statistics, GeoNames, Microsoft, Navinfo, Open Places, OpenStreetMap, Overture Maps Foundation, TomTom, Zenrin

5. Conclusion

The results emphasized the progress of the field and identified herding behavior as an important topic for behavioral finance and general economic study. The earliest period (1990–2000) framed herding primarily through the twin lenses of information cascades and reputational concerns, which were regarded as the principal drivers in herding studies. In the following decade (2000–2010), the literature underwent a fundamental shift: psychological factors including loss aversion, overconfidence, and social conformity were formally incorporated into herding models, moving the field beyond purely rational explanations. As a result, empirical attention turned to market crashes and momentum-driven bubbles, while agent-based modeling began to bridge micro-level heuristics with macro-level instabilities. Notably, mispricing remained a secondary theme, and systemic risk had not yet emerged as a central consequence. Hence, although the first two decades laid the behavioral and computational groundwork, the explicit linkage between herding and systemic financial instability remained largely prospective.

The era 2010-2015 witnessed a major trend toward systemic risks and contagion after the global financial crisis of 2008. Herding was identified as a crucial amplifier of market crashes among interlinked institutions. Asset price bubbles were mostly seen as harbingers of crashes rather than as phenomena per se, and mispricing received very little attention. Systemic hazards still were one of the most salient outcomes in the most recent decade (2015–2025) but are now researched within the framework of algorithmic trading, high-frequency data, and machine learning. Due to the rise of cryptocurrencies, NFTs, and meme stock markets, which are frequently fueled by social media and algorithmic herding, asset price bubbles have reemerged. Mispricing also became a much discussed topic, especially momentary mispricing caused by high-frequency trading and information cascades. This decade has seen a diversification of outcomes. Systemic risks remain, and bubbles and mispricing have re-emerged with technological progress. Furthermore, the relationship between

algorithmic trading and herding has given rise to new types of pricing inefficiencies that did not exist in previous times. The temporal trajectory thus appears to be one of clear evolution: from reputational and informational herding (1990–2000), to psychologically grounded instability (2000–2010), then systemic risk as a dominant paradigm (2010–2015), and finally a technology-enhanced environment in which bubbles, mispricing and systemic risks co-evolve in new ways.

The top ten productive sources of publishing on herding behavior in financial markets have contributed significantly to the scholarly debate on the topic. As shown in Figure 8, Finance Research Letters is the most productive journal with 45 publications and has become the main conduit for empirical research on behavioral finance. The Journal of Behavioral Finance and Journal of Economic Behavior & Organization are close behind, with 34 each, showing the interdisciplinary nature of the topic, merging behavioral economics, psychology and financial markets. The International Review of Financial Analysis and International Review of Economics & Finance, two other significant contributors, draw attention to the ongoing interest in herding behavior from applied and international finance viewpoints. The dynamics of herding in developing markets have received increasing attention, as evidenced in journals such as the Pacific-Basin Finance Journal and Developing Markets Finance and Trade. Also cited is the American Economic Review, which draws attention to the theoretical significance of herding behavior, linking finance to wider economic discourse. The heterogeneity, but specialization of the publication landscape as a whole shows the important contribution of these publications to the development of herding behavior research in many disciplines.

Analysis of international distribution of citations and authors' affiliations identified significant differences in academic impact and international cooperation regarding herding behavior in financial markets. The United States dominates the field with 27,002 total citations, as seen in Figure 11, showing its leading position in creating high-impact research. China, second in overall citations, has a poorer citation effectiveness (lower citations per publication ratio). This can be explained by several reasons: most of the rapidly increasing Chinese output (a significant proportion of Chinese papers are published only in recent years and have not yet had time to accumulate citations) is very recent; there is a significant number of papers published in domestic Chinese journals with a lower international visibility and impact factor, which diminishes their citation counts in international databases. Germany and the United Kingdom have a balanced citation profile, with Germany being a country with contributions that are regularly impactful. Conversely, countries with little research output, such as France and Greece, provide high citation efficiency, which suggests their contributions are well focused and have a considerable academic influence. Table 5 shows the ten nations with the most corresponding author affiliations, with the United States and China being the leading contributors, indicating that while the United States has a robust domestic research base, China is strengthening its worldwide research collaborations. European countries, especially the United Kingdom, France and the Netherlands, demonstrate high levels of cross-border cooperation, highlighting the expanding relevance of international networks in promoting research on herding behavior. The world map in Figure 19 shows the global distribution of scientific production on herding behavior and reveals a highly concentrated but internationally diversified research landscape. The main providers are the United States and China, reflecting both the size of their academic systems and the significance of herd-related phenomena in vast, complicated financial markets. European countries and, together with South Korea and Japan, East Asian countries also contribute significantly, showing the increasing relevance of herding behavior studies in markets where retail activity is substantial and information is rapidly disseminated. This fluid and varied architecture of worldwide research shows the centrality of national market features, institutional capability and susceptibility to market volatility in spurring scholarly interest in herding behavior. Overall, the global research environment is

interwoven, with powerful countries determining the intellectual orientation, while lesser nations contribute through intensive international collaboration, jointly strengthening the knowledge base of herding behavior in financial markets.

The overview of the landmark works that have influenced the intellectual path of this area is provided by studying the top ten most widely and locally cited texts in herding behavior research, as shown in Table 6 and Figure 13. The most influential study on informational cascades is the global study by Banerjee (1992) with 3,202 citations and a continuous impact on the creation of herding behavior models. Scharfstein and Stein (1990) and subsequent key work such as Grinblatt et al. (1995) and Lux (1995) further cemented the field's theoretical and empirical basis. These publications, which are both early theoretical breakthroughs and empirical advances, continue to ground the global scholarly conversation. The investigations of Banerjee (1992) and Bikhchandani et al. (1992) are especially important on the local level as they show the continuous importance of simple models of herding and informational cascades in shaping both theoretical and applied work. Other local references, such as Chang et al. (2000) and Lakonishok et al. (1992), emphasize the significant relevance of empirical studies in market-level herding and the application of these ideas. This clustering of citations around these seminal works, both globally and locally, underscores a cohesive and enduring intellectual core that continues to propel the advancement of herding behavior research. It encompasses theoretical frameworks and practical approaches that mould the conversation surrounding financial market behavior.

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