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Research in International Business and Finance

journal homepage: www.elsevier.com/locate/ribaf

Full length Article

Thirty years of herd behavior in financial markets: A bibliometric analysis

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ARTICLE INFO

JEL classification:

G15
G14

Keywords:

Herding behavior
Financial markets
Bibliometrics
Web of science

ABSTRACT

Bibliometric studies have proven useful in helping researchers better explore the current research trends within a particular field of study. This study analyzes academic research on herd behavior in financial markets conducted over 30 years. The Web of Science database was selected to collect bibliographic material and provide various bibliometric indicators, including the number of citations, publications, and authors, while bibliometric techniques were also employed for visualizing the similarities. The results show a significant growth in research on herd behavior, especially following the subprime crisis. The concluding results from the literature indicate that there is no consensus regarding the causes of this phenomenon, but new perspective have emerged to expand research on herd behavior.

1. Introduction

Herd behavior is the conduct of individuals acting collectively without a centralized direction. This behavior may occur in animals and humans in several contexts. In the area of finance, herding is the tendency of individuals (or organizations) to imitate others' actions following interactive observation of each other's practices (Hirshleifer and Teoh, 2003). According to Erdenetsogt and Kallinterakis (2016), the practice of herding assumes that individuals follow others' behavior disregarding their own private signals or prevailing market fundamentals. Scharfstein and Stein's (1990) seminal study on herd behavior covered different periods, countries, financial crises, financial markets, and types of investors. In turn, various methods and models have been used to explain this behavior. For a better understanding of this phenomenon, important reviews of literature have been presented for the first decade of its existence in Hirshleifer and Teoh (2003) and for the second decade in Spyrou (2013).

The so-called subprime crisis was a turning point in the research on herd behavior. Web of Science information showed that, between 1990 and 2007, 65 articles with 1944 citations were published. In the subsequent 5 years (2008–2012), there were 74 articles with 2913 citations. In the past 7 years (2014–2019), there were 168 articles with 10,155 citations. The increased interest in this topic

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<https://doi.org/10.1016/j.ribaf.2021.101506>

Received 19 November 2020; Received in revised form 2 August 2021; Accepted 7 August 2021

Available online 18 August 2021

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and subsequent publications has allowed research to be undertaken in certain sub-areas. Therefore, an updated and general vision of herd behavior in financial markets is warranted. To achieve this goal, a bibliometric analysis covering 30 years of research on herd behavior in financial markets is used. The result is a detailed and systematic source of information on the scientific production of a discipline (Bonilla et al., 2015), which may serve as a reference for researchers. It allows for the assessment of scientific activity, impact of publications, and sources to direct new research (Moreno and Rosselli, 2012).

The results demonstrate a significant growth of research in this area, generating the advancement of sub-areas of interest for researchers, which is divided into five well-defined research groups. The first group focused on having deeper understanding of herding behavior. This cluster is characterized by various methods and models used in this study. The second group is centered on evidencing the existence of behavioral herd in several financial markets and the reasons or causes that may explain this behavior. In the third, this behavior is studied during a financial crisis. The fourth concentrates on how the kind of investor affects herding behavior, and in the last group, the study focuses on how herding behavior presents itself and its potential effects on portfolio management.

The literature review shows that there is still no consensus regarding the causes of this phenomenon; therefore, new questions and perspectives arise that justify the continuation of studies on herd behavior. This study is presented as follows: Section 2 describes the methodology; Section 3 presents the results; and Section 4 presents the conclusions.

2. Methodological design

Over the past decade, bibliometric studies with systematic literature review have helped scholars to better explore research trends within a specific field of study and identify future lines of research in areas such as business models (Coombes and Nicholson, 2013), economics (Bonilla et al., 2015), entrepreneurship (López-Fernández et al., 2016), political economy (Amiguet et al., 2017), operations research and management science (Merigó and Yang, 2017), international business (Rialp et al., 2019), and industrial marketing (Valenzuela-Fernandez et al., 2019). Despite the various methods for bibliographic data analysis (Ding et al., 2014), this study focuses on the total number of documents and citations as these indicators are useful for measuring productivity and its influence (Merigó and Yang, 2017).

The Web of Science Core Collection database was used for the systematic literature review, because it is (generally) one of the main databases for classifying academic research. The database includes more than 15,000 journals and 50 million documents. We used the procedure proposed by Smart et al. (2003) that has been widely applied in similar studies (Fernández et al., 2015; Mura et al., 2018). Initially, an exploratory review of articles on “herding behavior” in “financial markets” was conducted to obtain an updated overview of the topic under study, create a list of keywords, and gather a set of terms. After several iterations, a series of terms that allowed retrieving articles related to the topic were effectively collected. The final search query was as follows: ((herd* OR herd* behav* OR herd* effect*) AND (capital* market* OR financial* market*)). This query was applied using the “TS” field tag in the Web of Science, which conducts searches in titles, abstracts, and keywords. Our data set from Web of Science was retrieved on January 29, 2021, which resulted in an initial data set comprising 531 articles.

The selection of articles was limited to those concerning the research area of “Business and Economics,” which was evaluated through double-blind peer review only (Delgado García et al., 2015). In the resulting sample, 50 articles without keywords and 17 without year of publication were identified. This information was completed. In addition, 22 articles belonging to other areas of study (e.g., sociology and psychology) were eliminated. Thus, our final sample consisted of 329 articles for 1990–2020.

To provide a graphic description of the bibliographic results, the visualization software VOS viewer (van Eck and Waltman, 2010) was used. This software compiles bibliographical data and displays the results in various maps and tables. VOS viewer applies several

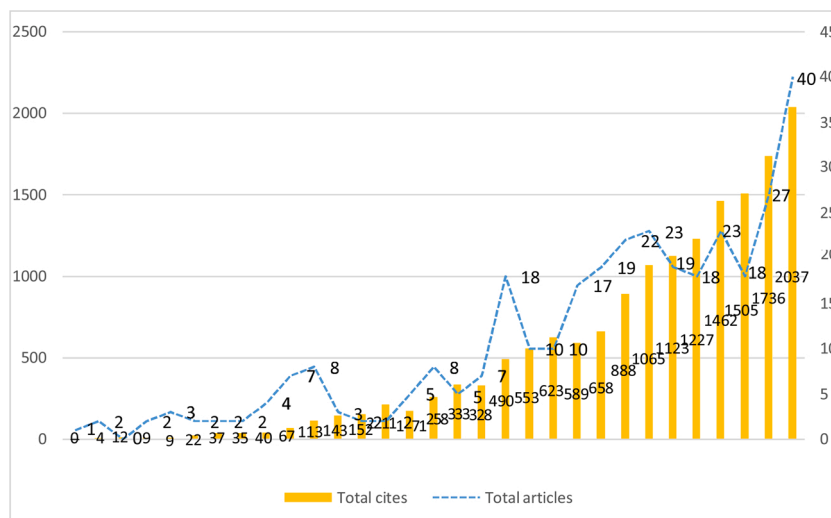


Fig. 1. Articles and Citations.

Table 1
Most cited articles.

	Article	Authors	Journal	Year	Total citations	Average per year
1	Herd behavior and investment	Scharfstein, D.; Stein, J.	<i>American Economic Review</i>	1990	1172	36.63
2	Momentum investment strategies, portfolio performance, and herding: A study of mutual fund behavior	Grinblatt, M.; Titman, S.; Wermers, R.	<i>American Economic Review</i>	1995	691	25.59
3	Mutual fund herding and the impact on stock prices	Wermers, R.	<i>Journal of Finance</i>	1999	602	26.17
4	Herding and feedback trading by institutional and individual investors	Nofsinger, J.; Sias, R.	<i>Journal of Finance</i>	1999	553	24.04
5	Herd behavior and aggregate fluctuations in financial markets	Cont, R.; Bouchaud, J.	<i>Macroeconomic Dynamics</i>	2000	487	22.14
6	Herd behavior, bubbles and crashes	Lux, T.	<i>Economic Journal</i>	1995	464	17.19
7	Ants, rationality, and recruitment	Kirman, A.	<i>Quarterly Journal of Economics</i>	1993	410	14.14
8	Security analysts' career concerns and herding of earnings forecasts	Hong, H.; Kubik, J.; Solomon, A.	<i>Rand Journal of Economics</i>	2000	388	17.64
9	Rational herding in financial economics	Devenow, A.; Welch, I.	<i>European Economic Review</i>	1996	388	14.92
10	Dynamic correlation analysis of financial contagion: Evidence from Asian markets	Chiang, T.; Jeon, B.; Li, H.	<i>Journal of International Money and Finance</i>	2007	379	25.27
11	Herd behavior in financial markets	Bikhchandani, S.; Sharma, S.	<i>IMF Staff Papers</i>	2001	379	18.05
12	On crises, contagion, and confusion	Kaminsky, G.; Reinhart, C.	<i>Journal of International Economics</i>	2000	370	16.82
13	An examination of herd behavior in equity markets: An international perspective	Chang, E.; Cheng, J.; Khorana, A.	<i>Journal of Banking & Finance</i>	2000	362	16.45
14	Institutional herding	Sias, R.	<i>Review of Financial Studies</i>	2004	347	19.,28
15	Analyst forecasts and herding behavior	Trueman, B.	<i>Review of Financial Studies</i>	1994	319	11.39
16	The socioeconomic dynamics of speculative markets: interacting agents, chaos, and the fat tails of return distributions	Lux, T.	<i>Journal of Economic Behavior & Organization</i>	1998	300	12.5
17	Bank competition and stability: Cross- country heterogeneity	Beck, T.; De Jonghe, O.; Schepens, G.	<i>Journal of Financial Intermediation</i>	2013	286	31.,78
18	Do Retail Trades Move Markets?	Barber, B.; Odean, T.; Zhu, N.	<i>Review of Financial Studies</i>	2009	284	21.85
19	Rational contagion and the globalization of securities markets	Calvo, G.; Mendoza, E.	<i>Journal of International Economics</i>	2000	274	12.45
20	Multidimensional uncertainty and herd behavior in financial markets	Avery, C.; Zemsky, P.	<i>American Economic Review</i>	1998	269	11.21
21	Contagion: Understanding how it spreads	Dornbusch, R.; Park, Y.; Claessens, S.	<i>World Bank Research Observer</i>	2000	268	12.18
22	Herding among security analysts	Welch, I.	<i>Journal of Financial Economics</i>	2000	267	12.,14
23	Security analysis and trading patterns when some investors receive information before others	Hirshleifer, D.; Subrahmanyam, A.; Titman, S.	<i>Journal of Finance</i>	1994	265	9.46
24	Financial analyst characteristics and herding behavior in forecasting	Clement, M.; Tse, S.	<i>Journal of Finance</i>	2005	264	15.53
25	An empirical analysis of herd behavior in global stock markets	Chiang, T.; Zheng, D.	<i>Journal of Banking & Finance</i>	2010	260	21.,67
26	Herding among investment newsletters: Theory and evidence	Graham, J.	<i>Journal of Finance</i>	1999	255	11.09
27	What caused the Asian currency and financial crisis?	Corsetti, G.; Pesenti, P.; Roubini, N.	<i>Japan and the World Economy</i>	1999	248	10.,78
28	The pricing of sovereign risk and contagion during the European sovereign debt crisis	Beirne, J.; Fratzscher, M.	<i>Journal of International Money and Finance</i>	2013	195	21.67
29	A century of corporate takeovers: What have we learned and where do we stand?	Martynova, M.; Renneboog, L.	<i>Journal of Banking & Finance</i>	2008	193	13.79
30	What triggers market jitters? A chronicle of the Asian crisis	Kaminsky, G.; Schmukler, S.	<i>Journal of International Money and Finance</i>	1999	148	6.43

Note: This table displays the 30 most cited articles. The first column shows their order, from the most cited to the least. In the second and third columns, the respective title of the article and authors are reported. Columns 4 and 5 show the respective journal and year of publication. Column 6 shows the total number of times cited. In the last column, the average number of citations that the article has had each year, from its year of publication to 2020, is reported.

bibliometric techniques, including bibliographic coupling, citation, and co-occurrence of author's keywords. Bibliographic coupling (Kessler, 1963) occurs when two documents cite the same third document. This software was used to observe the coincidence of the most frequent keywords in these documents.

3. Results

3.1. Publication and citation of herd behavior

Fig. 1 shows the evolution of the number of articles and citations on herd behavior in financial markets over the past 30 years. The first article considered in our sample was published in 1990 (Scharfstein and Stein, 1990). The authors investigated some of the forces that may lead to herd behavior, considering Keynes's (1936) suggestion that professional managers will "follow the herd" if they are concerned about third-party assessment of their ability to make sound judgments. They found that, under certain circumstances, managers simply imitate the investment decisions made by other managers and ignore substantial private information.

Despite the studies published in the early 1990s and the following decade, it was not before the subprime crisis that researchers began to focus on the concept of herd behavior. In fact, between 1990 and 2007, only 65 articles with 1944 citations on this topic were published. From 2008–2012, the number of articles increased to 74 with 2913 citations, that is, publications increased by 14 % in these 5 years than during the previous 18 years. In turn, citations witnessed an increase of 67 % during the same period. Since then, the interest in understanding and explaining herd behavior in financial markets has increased significantly. Over the past 7 years (2014–2020) 168 articles with 10,155 citations were published, which far surpassed the 161 articles and 5745 citations issued in the previous 24 years (1990–2013). In addition, about 15 articles were published per year in the past 20 years, while nearly 23 articles were published per year in the past 10 years. Overall, 83 % of the articles have been cited at least once and 61 % have been cited at least five times.

Table 2
Countries with the most publications and citations.

Panel A: Ordered by no. of papers				Panel B: Ordered by no. of citations			
ID	Country	No. Papers	Citations	ID	Country	No. Papers	Citations
1	USA	94	7658	1	USA	94	7658
2	England	52	1225	2	Germany	39	1291
3	Germany	39	1291	3	England	52	1225
4	China	29	584	4	France	23	1086
5	France	23	1086	5	China	29	584
6	Taiwan	19	164	6	Netherlands	10	558
7	Italy	15	348	7	Belgium	5	473
8	Spain	15	194	8	South Korea	11	376
9	Greece	13	361	9	Greece	13	361
10	South Korea	11	376	10	Italy	15	348
11	Canada	10	171	11	Spain	15	194
12	Netherlands	10	558	12	Canada	10	171
13	Australia	9	45	13	Switzerland	7	169
14	Chile	7	48	14	Taiwan	19	164
15	Switzerland	7	169	15	Brazil	5	114
16	Tunisia	7	36	16	Sweden	5	110
17	Japan	6	26	17	Ireland	2	89
18	Belgium	5	473	18	Austria	2	73
19	Brazil	5	114	19	Turkey	4	68
20	Denmark	5	26	20	Israel	4	65
21	New Zealand	5	47	21	Scotland	5	63
22	Scotland	5	63	22	Chile	7	48
23	Sweden	5	110	23	New Zealand	5	47
24	Israel	4	65	24	Australia	9	45
25	Saudi Arabia	4	9	25	Tunisia	7	36
26	Turkey	4	68	26	Cyprus	2	35
27	Pakistan	3	22	27	Tanzania	2	33
28	Poland	3	16	28	Norway	2	27
29	Portugal	3	15	29	Japan	6	26
30	Austria	2	73	30	Denmark	5	26

Note: This table reports the 30 countries with the most publications and citations. The authors' nationality were considered so that the same article may be assigned to one or more countries. Panel A lists by the number of articles, while Panel B lists by the number of citations. The country, number of articles, and number of citations are reported in each panel.

3.2. Most cited papers

Table 1 displays the 30 most cited articles in the sample, with their respective authors, journal, year of publication, total number of citations, and the average number of citations per year. The most cited article was published by *American Economic Review*. The article by Scharfstein and Stein (1990), entitled, “Herd behavior and investment,” has been cited 1172 times, which corresponds to 7.4 % of total citations. Of the 30 most cited articles, 21 were published in between 1990 and 2000, 7 between 2001 and 2010, and 2 between 2011 and 2020. The five most cited articles represent 22 % of the total citations, while the 10 most cited represent 37 %.

3.3. Countries with the highest number of articles and citations

Table 2 presents the 30 countries with the most publications and citations to which the authors belong, sorted by the number of papers published (Panel A) and the number of citations (Panel B). The country corresponds to the affiliations indicated by the authors of each article. If the author indicates two or more affiliations, only the first one is considered. Overall, 55 countries are represented, with the United States having the highest number of published articles (94) and citations (7658), representing 29 % of the total number of articles and 48 % of the total number of citations in the sample.

Table 3
Journals with the highest number of articles and citations.

Panel A: Ordered by no. of papers				Panel B: Ordered by no. of citations			
ID	Journals	No. papers	Citations	ID	Journals	No. Papers	Citations
1	<i>Journal of Behavioral Finance</i>	15	100	1	<i>American Economic Review</i>	8	2473
2	<i>International Review of Financial Analysis</i>	14	272	2	<i>Journal of Finance</i>	7	2095
3	<i>Journal of Economic Behavior & Organization</i>	13	533	3	<i>Journal of Banking & Finance</i>	12	1105
4	<i>Journal of Banking & Finance</i>	12	1105	4	<i>Review of Financial Studies</i>	5	1062
5	<i>Emerging Markets Finance and Trade</i>	9	35	5	<i>Journal of International Money and Finance</i>	5	750
6	<i>American Economic Review</i>	8	2473	6	<i>Journal of International Economics</i>	2	643
7	<i>Applied Economics</i>	8	46	7	<i>Journal of Financial Economics</i>	6	606
8	<i>Computational Economics</i>	8	47	8	<i>Macroeconomic Dynamics</i>	8	579
9	<i>Macroeconomic Dynamics</i>	8	579	9	<i>Journal of Economic Behavior & Organization</i>	13	533
10	<i>Journal of Economic Interaction and Coordination</i>	7	13	10	<i>Economic Journal</i>	1	464
11	<i>Journal of Finance</i>	7	2095	11	<i>Quarterly Journal of Economics</i>	1	410
12	<i>Journal of International Financial Markets Institutions & Money</i>	7	293	12	<i>European Economic Review</i>	3	407
13	<i>Quantitative Finance</i>	7	122	13	<i>Rand Journal of Economics</i>	1	388
14	<i>Journal of Economic Dynamics & Control</i>	6	220	14	<i>IMF Staff Papers</i>	1	379
15	<i>Journal of Financial Economics</i>	6	606	15	<i>Journal of Financial Intermediation</i>	2	312
16	<i>Pacific-Basin Finance Journal</i>	6	40	16	<i>Journal of International Financial Markets Institutions & Money</i>	7	293
17	<i>European Journal of Finance</i>	5	19	17	<i>International Review of Financial Analysis</i>	14	272
18	<i>International Journal of Finance & Economics</i>	5	2	18	<i>World Bank Research Observer</i>	1	268
19	<i>Journal of International Money and Finance</i>	5	750	19	<i>Japan and the World Economy</i>	1	248
20	<i>Review of Financial Studies</i>	5	1062	20	<i>Journal of Economic Dynamics & Control</i>	6	220
21	<i>Economic Modelling</i>	4	65	21	<i>Econometrics</i>	2	181
22	<i>International Journal of Islamic and Middle Eastern Finance and Management</i>	4	21	22	<i>Management Science</i>	2	134
23	<i>North American Journal of Economics and Finance</i>	4	71	23	<i>Quantitative Finance</i>	7	122
24	<i>Applied Economics Letters</i>	3	17	24	<i>Journal of Economic Theory</i>	2	114
25	<i>Asia-Pacific Journal of Financial Studies</i>	3	6	25	<i>Journal of Behavioral Finance</i>	15	100
26	<i>Emerging Markets Review</i>	3	20	26	<i>Journal of Business Finance & Accounting</i>	2	73
27	<i>European Economic Review</i>	3	407	27	<i>North American Journal of Economics and Finance</i>	4	71
28	<i>European Financial Management</i>	3	32	28	<i>Economic Modelling</i>	4	65
29	<i>International Review of Economics & Finance</i>	3	39	29	<i>Jahrbucher fur Nationalokonomie Und Statistik</i>	1	65
30	<i>Journal of Real Estate Finance and Economics</i>	3	38	30	<i>Journal of Business</i>	1	61

Note: This table represents journals with more than one publication. Panel A lists by the number of articles, while Panel B by the number of citations. In each panel, the first column represents the ranking of the journal from the most productive to the least; the second, the name of the journal; and in the third column, the total number of articles published by the said journal.

The nationality of the researchers is highly concentrated in developed countries. The United States, the United Kingdom, and Germany account for 56 % of the total number of articles and 64 % of the total number of citations. China emerged with more publications, accounting for 8.8 % of the total number of articles and 3.7 % of the total number of citations.

3.4. Journals with the highest number of articles and citations

Table 3 presents the 30 most productive journals according to the number of articles published (Panel A) and number of citations (Panel B). The *Journal of Behavioral Finance* has the most published articles (15), accounting for 11 % of total publications. *American Economic Review* is the journal with the most citations (2473), representing 15.6 % of total citations. The five most cited journals (*American Economic Review*, *Journal of Finance*, *Journal of Banking & Finance*, *Review of Financial Studies*, and *Journal of International Money and Finance*) comprised 47.1 % of the citations.

3.5. Universities with the highest number of articles and citations

Table 4 presents the 30 most productive universities according to the number of articles published (Panel A) and number of citations (Panel B).

Table 4
Universities with the highest number of publications and citations.

Panel A: Ordered by no. of papers				Panel B: Ordered by no. of citations			
ID	University	No. Papers	Citations	ID	University	No. Papers	Citations
1	University of Bamberg	10	531	1	Harvard University	4	1627
2	University of California Los Angeles	9	208	2	University of California Los Angeles	3	878
3	George Washington University	7	730	3	NBER	4	827
4	Tilburg University	6	513	4	George Washington University	7	730
5	University of Liverpool	6	230	5	Drexel University	4	699
6	University Piraeus	6	199	6	Univ Maryland	5	689
7	Bank England	5	118	7	Marquette University	1	552
8	University of Illinois	5	124	8	Washington State University	1	552
9	Stanford University	5	156	9	University Bamberg	10	531
10	University of California Davis	5	341	10	Tilburg University	6	513
11	University Kiel	5	241	11	Université Paris-Saclay	1	487
12	University Maryland	5	689	12	École Polytechnique	1	487
13	Drexel University	4	699	13	World Bank	3	437
14	Federal Reserve Bank New York	4	281	14	University Bonn	3	413
15	Harvard University	4	1627	15	Georgia Institute Technology	2	401
16	International Monetary Fund	4	77	16	Duke University	3	396
17	NBER	4	827	17	NBER	3	394
18	Newcastle University	4	53	18	New York University	3	394
19	University Jaume I	4	24	19	University of Winchester	1	378
20	University Minnesota	4	126	20	Chinese University of Hong Kong	1	361
21	University Zaragoza	4	83	21	University of Hong Kong	1	361
22	Athens University Econ & Business	3	118	22	Yale University	2	359
23	Audencia Business School	3	30	23	INSEAD	3	344
24	Chung Yuan Christian University	3	19	24	University of California Davis	5	341
25	Centre National de la Recherche Scientifique (Cnrs)	3	23	25	Centre for Economic Policy Research (CEPR)	1	286
26	Deutsch Bundesbank	3	47	26	University of Ghent	1	286
27	Duke University	3	396	27	Federal Reserve Bank New York	4	281
28	Federal Reserve Board	3	48	28	Korea University	1	268
29	INSEAD	3	344	29	MIT	1	268
30	Kansai University	3	10	30	Boston college	1	265

Note: This table lists the most productive universities by number of publications. Panel A presents the number of articles, while Panel B by the number of citations. In each panel, the university, number of articles, and citations are reported.

3.6. Authors with the highest number of papers and citations

Table 5 exhibits the 30 most productive authors according to the number of papers published (Panel A) and number of citations (Panel B). Overall, 663 authors were found in the sample, where, on average, each article had two authors. In turn, 72 authors were found to have two or more articles. Frank Westerhoff from Otto-Friedrich-Universität Bamberg (Germany) has the most publications (seven).

3.7. Cluster analysis

Word co-occurrence refers to the joint occurrence of terms in a given text. The content is analyzed based on the joint occurrence of pairs of terms or words to identify the relationships between concepts within a topic. Thus, the higher the frequency of joint occurrence of words, the greater the conceptual linkage. By extracting the keywords, descriptions, or titles of the documents, it is possible to establish the central themes developed by the authors, as well as the relationship that exists between these themes.

The number and grouping of keywords in the VOS viewer depends on the minimum number of determined occurrences. A minimum of four occurrences for each keyword was determined. Of 1389 keywords, 119 met this criterion. Fig. 2 presents the results of the VOS viewer software used on the database obtained directly from the Web of Science. Each color represents a subset of keywords grouped according to the number of publications in which they occur together. The larger the size of the circle, the greater the number of articles containing that keyword. Table 6 shows the keywords of each subset of words (clusters) and the number of articles ($n - 1$) containing them. This analysis allowed us to identify five groups of studies on herding behavior in the last 30 years. In this study, these studies have been categorized as understanding and contagion, extension and effects, behavior during crises, investment, and portfolio management. Fig. 3 summarizes the composition of each cluster over the years and reports the total number of citations per year. Results suggest that initial research on herding behavior was focused on understanding this phenomenon and extending its study by investigating the effects and forms of contagion. In the past decade, however, studies have focused on periods of crisis.

In the *comprehension and contagion* cluster (1), there are 85 articles with 3037 citations and an average of 35.7 citations per article. The most cited articles correspond to Kirman (1993) with 410 citations, Devenov and Welch (1996) with 388 citations, Calvo and Mendoza (2000) with 273 citations, Dornbusch et al. (2000) with 268 citations, and Graham (1999) with 255 citations. The top five

Table 5
Authors with the highest number of articles and citations.

Panel A: Ordered by no. of papers				Panel B: Ordered by no. of citations			
ID	Name	No. Papers	Citations	ID	Name	No. Papers	Citations
1	Westerhoff, F.	7	155	1	Wermers, R.	2	1293
2	Cipriani, M.	6	129	2	Scharfstein, D.	1	1172
3	Guarino, A.	6	129	3	Stein, J.	1	1172
4	Demirer, R.	5	122	4	Titman, S.	2	956
5	Economou, F.	5	205	5	Sias, R.	2	899
6	Schmitt, N.	5	46	6	Lux, T.	2	764
7	Kallinterakis, V.	4	76	7	Grinblatt, M.	1	691
8	Sornette, D.	4	162	8	Chiang, T.	3	655
9	Alfarano, S.	3	123	9	Welch, I.	2	655
10	Babalos, V.	3	85	10	Nofsinger, J.	2	613
11	Chiang, T.	3	655	11	Kaminsky, G.	2	518
12	Galariotis, E.	3	118	12	Bouchaud, J.	1	487
13	Lux, T.	3	132	13	Cont, R.	1	487
14	Morone, A.	3	9	14	Kirman, A.	2	456
15	Nakagawa, R.	3	10	15	Li, H.	2	395
16	Philippas, N.	3	169	16	Devenow, A.	1	388
17	Spyrou, S.	3	118	17	Hong, H.	1	388
18	Bekiros, S.	2	21	18	Kubik, J.	1	388
19	Blasco, N.	2	83	19	Solomon, A.	1	388
20	Chari, V.	2	121	20	Bikhchandani, S.	1	379
21	Chen, Z.	2	10	21	Sharma, S.	1	379
22	Choi, N.	2	176	22	Jeon, B.	1	378
23	Decamps, J. I.	2	12	23	Reinhart, C.	1	370
24	Di Guilmi, C.	2	9	24	Chang, E.	1	361
25	Espinosa-Mendez, C.	2	0	25	Cheng, J.	1	361
26	Fang, H.	2	1	26	Khorana, A.	1	361
27	Ferreruela, S.	2	83	27	Trueman, B.	1	319
28	Franke, R.	2	109	28	Beck, T.	1	286
29	Gai, P.	2	1	29	De Jonghe, O.	1	286
30	Gallegati, M.	2	27	30	Schepens, G.	1	286

Note: This table reports the 30 authors with the most publications. Panel A lists by number of articles, while Panel B by number of citations. In each panel, the author, number of articles, and citations are reported.

Table 6
Clusters.

Num	Cluster 1 Comprehension and Contagion	(a)	Cluster 2 Extension and Effects	(a)	Cluster 3 Behavior During crises	(a)	Cluster 4 Investment	(a)	Cluster 5 Portfolio Management	(a)
1	Markets or Market	52	Herding Behavior	133	Prices	39	Herding	89	Information	51
2	Model	39	Financial-Markets	42	Volatility	37	Impact	69	Investment	42
3	Cascades	19	Liquidity	20	Returns	31	Behavior	64	Performance	35
4	Informational Cascades	19	Stock-Market	20	Financial Crisis	28	Risk	42	Earnings Forecasts	9
5	Uncertainty	14	Bubbles	19	Contagion	24	Stock-Prices	30	Market Efficiency	8
6	Herd	13	Dynamics	19	Stock Markets	18	Investors	22	Security Analysts	8
7	Reputation	10	Expectations	12	Behavioral Finance	13	Stock Returns	13	Career Concerns	6
8	Information Cascades	9	Fluctuations	12	Crisis	12	Institutional Investors	10	Compensation	6
9	Efficiency	8	Financial Markets	11	Overconfidence	12	Cross-section	7	Forecasts	6
10	Financial Contagion	7	Speculation	11	Noise	11	Investment Strategies	7	Recommendations	6
11	Imitation	7	Strategies	8	Emerging Markets	10	Information Asymmetry	6	Stock	6
12	Internet	7	Trading Volume	7	Investor Sentiment	9	Mutual Fund	5	Delegated Portfolio Management	5
13	Economics	6	Agent-Based Model	6	Momentum	9	Ownership	5	Price Changes	5
14	Fads	6	Chaos	6	Determinants	8	Experience	<5	Trading Volume	<5
15	Systemic Risk	6	Equilibrium	6	Equity Markets	8	Investment	<5	Portfolio	<5
16	Stability	<5	Stylized Facts	6	Investors Herd	8	International Financial Markets	<5	Price	<5
17	Diffusion	<5	Crashes	5	Interdependence	7	Mutual Fund Performance	<5	Quality	<5
18	Aggregation	<5	Diversification	5	Sentiment	7	Private Information	<5	Reputation	<5
19	Competition	<5	Networks	5	Tests	7	Volatility	<5	Returns	<5
20	Conformity	<5	Technical and Fundamental Analysis	5	Global Financial Crisis	6	Strategies	<5	Analysts	<5

Note: This table presents the keyword clusters from the analysis through the VOS viewer and each article. (a) corresponds to the number of articles (n – 1) containing each keyword.

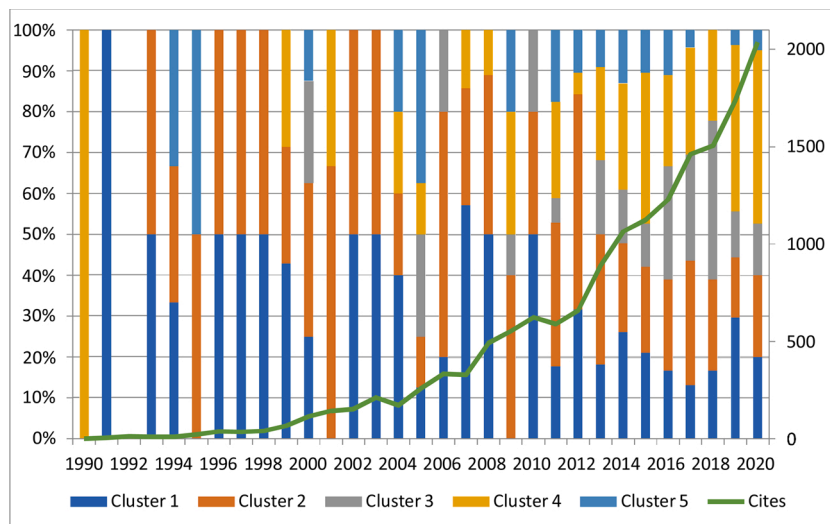


Fig. 3. Number of articles per cluster.

Note: This graph presents the distribution of clusters according to the number of published articles. In addition, the total number of citations per year is presented.

and Zou, 2008), and bank markets (Waheed and Mathur, 1993) as well as to have a better understanding of their effects, mainly on periods of financial bubbles. In this context, Lux (1995) presented a model in which he attempted to formalize herding behavior. Lux showed that the occurrence of financial bubbles is explained as a self-organized process among traders, leading to equilibrium prices

Table 7
Cluster information.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Total
Articles	85	96	44	77	27	329
Cites	3037	4523	2019	4232	2089	15,900
Authors	174	196	102	181	58	711
Universities	127	151	91	136	43	548
Countries	21	35	29	36	16	137
Journals	62	55	30	50	20	217

that deviate from the fundamental values. [Lux \(1995\)](#) postulated that speculators follow the crowd by observing stock price returns. However, he noted that there are several explanations for the herding behavior of speculative traders, such as considering that they act irrationally, they try to extract information from what others do and that reputation may encourage even intelligent investors to follow the crowd. [Chang et al. \(2000\)](#) studied herding behavior at the international level and found no evidence of herding in the United States and Hong Kong, but partial herding in Japan. For South Korea and Taiwan, they documented significant evidence of herding. In addition, they reported that macroeconomic information, rather than firm-specific information, tends to have a more significant impact on investor behavior in markets that exhibit herding behavior.

The cluster, *behavior during crisis* (3), has 44 articles with 2019 citations and an average of 48.9 citations per article. The most cited articles correspond to [Cont and Bouchaud \(2000\)](#) with 487 citations, [Kaminsky and Schmukler \(1999\)](#) with 370 citations, [Barber et al. \(2009\)](#)

with 283 citations, [Chiang and Zheng \(2010\)](#) with 260 citations, and [Drehmann et al. \(2005\)](#) with 86 citations. The top five keywords are to “prices” (39), “volatility” (37), “returns” (31), “financial crisis” (28), and “contagion” (24). The authors in this cluster belong to 29 different countries, among which the United States stands out with 11 articles and 1073 citations, followed by England with 6 articles and 265 citations. Further behind are Germany (5 articles and 167 citations), Greece (5 articles and 86 citations), and South Korea (4 articles and 82 citations). Research in this cluster is oriented to investigate herding during periods of crisis ([Kaminsky and Reinhart, 2000](#)), such as the Asian financial crisis ([Ghysels and Seon, 2005](#)), Eurozone crisis ([Mobarek et al., 2016](#); [Engel, 2016](#)), subprime crisis ([Hwang et al., 2013](#)), Asian and Global financial crisis ([Karanasos et al., 2016](#); [Omay and Perihan, 2019](#)), and the global financial crisis ([Stavroyiannis and Babalos, 2017](#); [Yousaf et al., 2018](#); [Kabir and Shakur, 2018](#)). In turn, several researchers corroborated the existence of this behavior, its causes and effects, in countries such as Argentina and Brazil ([Kabir and Shakur, 2018](#)), Kazakhstan ([Kobayashi et al., 2007](#)), Russia ([Indars et al., 2019](#)), Pakistan ([Yousaf et al., 2018](#)), Malaysia ([Omay and Perihan, 2019](#)), South Korea ([Hong and Yi, 2006](#)), and Egypt ([Metawa et al., 2019](#)), thus consolidating the study of herding behavior as a topic of interest in financial research. In this context, [Indars et al. \(2019\)](#), who studied the fundamental and non-fundamental factors driving the Russian stock market, reported that herding behavior varies with market trends and conditions such as liquidity, uncertainty, arrival of new information, and oil price volatility. [Kabir and Shakur \(2018\)](#) examined this behavior in Asian and Latin American markets with an emphasis on volatility. They reported that the driving force behind this behavior is high volatility rather than low returns. In contrast, some markets showed inverse herding behavior. [Bekiros et al. \(2017\)](#) investigated the asymmetric relationship between returns and implied volatility for 20 international developed and emerging markets. The authors reported evidence of an asymmetric and inverse return–volatility relationship in many Asian, Latin American, European, and South African markets. Specifically, Asian markets exhibited the lowest sensitivity to volatility expectations, while the Eurozone is characterized by a homogeneous response in terms of both direction and impact. The authors attributed these results to cultural and social characteristics.

The *investment* cluster (4) comprises 77 articles with 4232 citations and an average of 55 citations per article. The most cited articles correspond to [Scharfstein and Stein \(1991\)](#) with 1172 citations, [Wermers \(1999\)](#) with 602 citations, [Nofsinger and Sias \(1999\)](#) with 552 citations, [Bikhchandani and Sharma \(2001\)](#) with 379 citations, and [Chiang et al. \(2007\)](#) with 378 citations. The top five keywords correspond to “herding” (89), “impact” (69), “behavior” (64), “risk” (42), and “stock-prices” (30). The authors in this cluster belong to 36 different countries, among which the United States stands out with 16 articles and 2690 citations, followed by England with 11 articles and 138 citations. Further behind are China (9 articles and 18 citations), Spain (7 articles and 93 citations), and Taiwan (7 articles and 41 citations).

The research in this cluster is oriented to investigate the existence of herding behavior at a level focused on the type of investor. Thus, research in this cluster prevails in considering institutional investors ([Alda, 2015](#); [Balagoyzyan and Cakan, 2016](#); [Cai et al., 2019](#); [Choi and Sias, 2009](#); [Choi and Skiba, 2015](#); [Economou et al., 2015](#); [Guo and Qiu, 2016](#); [Kim et al., 2019](#)) and individual investors ([Chen and Ru, 2019](#); [Hsieh et al., 2020](#); [Nofsinger and Sias, 1999](#)). In turn, research in this area is extended to different countries and includes South Africa ([Guney et al., 2017](#)); the Islamic Gulf Cooperation Council stock markets, including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates ([Chaffai and Medhioub, 2018](#)); Chile ([Lavin and Magner, 2014](#)); Malaysia ([Pitluck, 2014](#)); Israel ([Andronikidi et al., 2020](#)); China ([Yang and Yang, 2014](#)); and Australia ([Espinosa-Méndez and Arias, 2020](#)).

With regard to institutional investors, several authors have studied how certain characteristics specific to this type of investor, such as investor types, habit investing, industry herding, portfolio allocation, and momentum trading, cause, explain, or are related to herd behaviors ([Guo and Qiu, 2016](#); [Nofsinger and Sias, 1999](#)). This category of articles also includes institutional investors, such as pension funds ([Raddatz and Schmukler, 2013](#)) and nonbank institutional investors ([Balagoyzyan and Cakan, 2016](#)). [Raddatz and Schmukler \(2013\)](#) focused on pension funds and found that herding is more prevalent for closely competing funds when comparing funds of the same type across pension fund managers (AFPs). [Economou et al. \(2015\)](#) focused on frontier markets and examined whether fund

managers cluster in frontier markets and whether herding is intentional or not. After analyzing the markets of Bulgaria and Montenegro, they found that herding is stronger for both markets during periods of positive market performance and high volume, while in the case of Montenegro it is also significant during periods of low volatility. In addition, Bulgarian (Montenegrin) fund managers clustered significantly after (before) the outbreak of the 2008 global financial crisis, attributing it to a volume effect, because Montenegro experienced the most intense trading activity before (after) the crisis. Dalgic et al. (2020) documented that different types of investors tend to cluster in bear markets at a daily frequency, while herding behavior disappears, and even reverses, at intraday frequency.

The *Portfolio management cluster* (5) comprises 27 articles with 2089 citations and an average of 73.4 citations per article. The most cited articles correlate to Grinblatt et al. (1995) with 691 citations, Hong (2000) with 288 citations, Trueman (1994) with 319 citations, Clement and Tse (2005) with 264 citations, and Cipriani and Guarino (2005) with 76 citations. The top five keywords correspond to “information” (51), “investment” (42), “performance” (35), “earnings forecasts” (9), and “market efficiency” (8). The authors in this cluster belong to 36 different countries, among which England stands out with 5 articles and 90 citations, followed by the United States with 4 articles and 187 citations. Further behind are Germany (4 articles and 84 citations), China (3 articles and 6 citations), and Taiwan (2 articles and 60 citations). Research in this cluster is aimed at investigating how herding behavior is present and/or can influence portfolio management. Grinblatt et al. (1995) analyzed the extent to which mutual funds purchase stocks based on their past returns, as well as their tendency to exhibit “herding” behavior. The authors found that 77 % of the mutual funds were “momentum investors,” buying stocks that were past winners; however, most did not systematically sell past losers. Sotiropoulos et al. (2020) examined portfolio strategies of the UK investment trust companies during the so-called first globalization era before the First World War and found strong performance and relatively sophisticated asset management, which was based on a mixture of a buy-and-hold investment strategy and active portfolio management; they thus avoided herding behavior in their choice of portfolio and developed a wide range of portfolio strategies. On the other hand, regarding earnings forecasts, Marinelli and Weissensteiner (2014) found that during banking stresses, when job security is low, analysts increasingly tend to imitate others. Thus, analysts followed the consensus forecast more closely when the banking sector prospects are negative (and vice versa). Bartholdy and Feng (2013) analyzed Chinese analysts’ earnings forecasts and stock recommendations and found that, for all securities, the average quality of the earnings forecast was positively biased. In short, the reactions to “Hold” and “Sell” recommendations were negative in the two bear markets but positive in the bull market. Thus, financial markets react differently in bull and bear markets to the same recommendations, which are consistent with securities firms using a ranking procedure when assigning recommendations.

4. Conclusions

Herding behavior is the action of individuals in a group performing collectively without centralized direction. Such behavior may occur in both animals and humans in several situations. In financial markets, since the seminal article by Scharfstein and Stein (1990), investigations have covered different periods, countries, financial crises, financial markets, and types of investors using various methods and models to offer reasons or causes that may explain this behavior.

Although important literature reviews exist in this area (Hirshleifer and Teoh, 2003; Spyrou, 2013), these have mainly included research for the first and second decade of studies. If the significant increase in publications and citations after the subprime crisis is considered, especially during the past decade, then it is necessary to have a current updated vision of research on herd behavior. To accomplish this, a bibliometric analysis was conducted, covering research on herd behavior in financial markets spanning 30 years. From the available research, 329 articles containing 15,900 citations were selected. The results identified five main clusters: understanding and contagion, extension and effects, behavior during crises, investment, and portfolio management.

The result is a detailed and systematic source of information on the scientific production of a discipline (Merigó et al., 2015), which serves as a reference for researchers and allows for the assessment of scientific activity, impact of publications, and sources to direct new research (Moreno and Rosselli, 2012). Over the past decade, bibliometric studies have proven useful in helping scholars better explore research trends within a specific field of study and identify future research lines in different areas.

The results show the significant growth of research in this area after the subprime crisis. This increase in publications and citations has led to the development of sub-areas of interest for research. These may be divided into five well-defined groups, which widen the evidence of the existence of herd behavior, and to find some explanation for its existence continues to be the focus of interest.

Some limitations of this study correspond to the method used. Although bibliometric techniques are used to obtain quantitative results, the final definition of the main fields of study will be determined by the researchers. Therefore, there could be biases when the publications related to the topic in question are filtered. Thus, one of the limitations of using bibliometric indicators is that they only provide information on the quantity of publications but not on their quality, thus these results must be combined with expert judgment from the field. Additionally, the article’s date of publication largely determines the number of times it has been cited, which could lead to articles with a significant impact being excluded from the main results but still have a low diffusion because they are more recent and, therefore, a lower number of citations. This study has examined only publications that are available on the Web of Science platform and others on the subject may have been available from other scientific dissemination platforms.

Future lines of research could incorporate, for example, the corporate governance of companies because entities from the same economic group could share investment strategies and, thereby, heighten herding behavior. This could be significant in companies with high property concentration and in institutions with a pyramidal structure. In this context, companies from the same socio-economic group would adopt herding behaviors to transfer wealth from minority shareholders to the controller. Another area for further research may be the fusion or integration of financial markets. This phenomenon generates more financial assets that investors can access, thus increasing the possibilities of diversifying their investment portfolio and, consequently, reducing risk. For companies,

this phenomenon increases their funding sources and, in turn, reduces funding costs. In both cases, participants could benefit from fusion or integration of financial markets. Thus, herding behavior could suffer alterations. On the one hand, it could be intensified as local companies, when becoming part of an integrated market, could simply follow the actions of leader companies owing to their lack of knowledge of the new markets. On the other hand, herding could be reduced because companies would be more cautious when investing. Therefore, companies could also specialize in their investment strategies and make individual decisions.

Author statement

João Paulo Vieito and Christian Enrique Espinosa Méndez developed the theory and performed the computations. Wing-Keung Wong and Munkh-Ulzii Batmunkh verified the analytical methods. Enkhbayar Chojil helped carry out some simulations. All authors discussed the results and contributed to the final manuscript.

Acknowledgments

The third author would like to thank Robert B. Miller and Howard E. Thompson for their continuous guidance and encouragement. This research has been supported by National University of Mongolia, Universidad de Santiago de Chile, Asia University, China Medical University Hospital, The Hang Seng University of Hong Kong, Escola Superior de Ciências Empresariais, Instituto Politécnico de Viana do Castelo and Applied Management Research Unit (UNIAG) - Portugal, Research Grants Council (RGC) of Hong Kong (project number 12500915), and Ministry of Science and Technology (MOST, Project Numbers 106-2410-H-468-002 and 107-2410-H-468-002-MY3), Taiwan.

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