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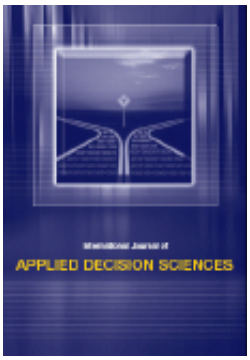


International Journal of Applied Decision Sciences

ISSN online: 1755-8085 - ISSN print: 1755-8077
https://www.inderscience.com/ijads

Behavioural finance research and knowledge mapping: a comprehensive bibliometric analysis from 2010 to 2022

Anshita Bihari, Manoranjan Dash, Padma Charan Mishra, Sukumar Dash

DOI: 10.1504/IJADS.2024.10058529

Article History:

Received:	08 June 2023
Last revised:	10 July 2023
Accepted:	11 July 2023
Published online:	03 December 2024

Behavioural finance research and knowledge mapping: a comprehensive bibliometric analysis from 2010 to 2022

Anshita Bihari

Institute of Business and Computer Studies,
Siksha O Anusandhan (Deemed to be University),
Khandagiri, Bhubaneswar, Odisha, India
Email: anshitabihari10@gmail.com

Manoranjan Dash

Faculty of Management Science,
Institute of Business and Computer Studies,
Siksha O Anusandhan (Deemed to be University),
Bhubaneswar, Odisha, India
Email: manoranjandash@soa.ac.in

Padma Charan Mishra*

The Bisra Stone Lime Company Limited,
Biramitrapur, Sundargarh, Odisha, 770033, India
Email: pcmishra71@gmail.com
*Corresponding author

Sukumar Dash

KIIT School of Rural Management,
KIIT (Deemed to be University),
Bhubaneswar, Odisha, India
Email: sukumar.dash@ksrm.ac.in

Abstract: The study aims to explore the patterns and connections in the behavioural biases and investment decisions of existing literature on the Web of Science database using Science mapping and performance analysis tools. This study selected 512 research papers from the Web of Science database published between 2010 and 2022 after deep screening – all influential authors with their citations exposed along with top journals. The pattern of the papers highlighted and the connection between literatures gives direction for future research. Publication on behavioural biases and investment decisions increased since 2016. The *Journal of Behavioural Finance* is leading in published documents, the *Journal of Financial Economics* has the highest citation count, and the USA is the top country in publications and citations. The outcome of this study provides valuable insights into the intellectual structure of biases of investors and adds value to the existing knowledge. This review offers

knowledge and theories for the behavioural finance discipline and provides a road map for the future trend of research on behavioural biases and investment decisions.

Keywords: knowledge mapping; behavioural biases; investment decision; bibliometric analysis.

Reference to this paper should be made as follows: Bihari, A., Dash, M., Mishra, P.C. and Dash, S. (2025) 'Behavioural finance research and knowledge mapping: a comprehensive bibliometric analysis from 2010 to 2022', *Int. J. Applied Decision Sciences*, Vol. 18, No. 1, pp.40–63.

Biographical notes: Anshita Bihari is a research scholar at the Institute of Business and Computer Studies, Siksha O Anusandhan (Deemed to be University). She has published three papers in reputed Scopus-indexed journals.

Manoranjan Dash is a Professor at the Institute of Business and Computer Studies, Siksha O Anusandhan (Deemed to be University). He has published more than 50 research papers in reputed journals indexed in Scopus, ESCI, etc.

Padma Charan Mishra is a Manager (Engineering) at the Bisra Stone Lime Company Limited, a Central Public Enterprise of the Government of India. He is a passionate researcher and has published more than 20-research papers in international journals of Inderscience, Emerald, Springer, etc.

Sukumar Dash is an Associate Professor at the KIIT School of Rural Management. He is an alumnus of Delhi University specialising in farmer collectives and agri supply chains. His professional career, which spans 25-years, involves rural collectivisation and marketing issues. He has travelled across the country to share his views on these issues. He is a member of WTC Mumbai; the Indian Oil seed produce export promotion council, and other trade bodies of the country. He was also on the expert committee of the Government of Odisha WTC cell to promote the export of safe foods.

1 Introduction

Traditional finance is composed of several concepts and theories like arbitrage pricing process by Modigliani and Miller (1958), the capital asset pricing model (CAPM) by Treynor (1961), the options pricing theory by Bachelier (1900), the principle of portfolio management by Markowitz (1991) and efficient market hypothesis by Fama (1970). Traditional theories indicate that investors are rational and always prefer getting optimum satisfaction while making decisions (Kumar and Goyal, 2015). A sensible investor makes profitable decisions continuously based on the available information (Barberis and Thaler, 2003). Many economists have raised questions regarding rationality. According to them, in some scenarios, the irrationality of the investors is reflected due to sentiments and biases (Mathur and Rastogi, 2018). In the 1970s, the energy crisis found that the traditional concept needed consistency. In the 1980s, behavioural finance proposed a new concept, i.e., a combination of behaviour and psychological aspects that helped understand investors' behavioural attitudes towards investment decisions in a different

context (Kahneman and Tversky, 1979). Behavioural finance explores how emotions and cognitive errors influence investor decision-making, challenging the traditional belief in full rationality. It examines the impact of psychology on financial practitioners and market efficiency, emphasising the limits to arbitrage and the role of biases in shaping investor behaviour. By drawing on cognitive psychology, behavioural finance explains investor irrationality and decision-making processes, highlighting its significance in understanding market inefficiencies (Ogunlusi and Obademi, 2021; Bihari et al., 2022). Chen et al. (2007) and Nofsinger and Sias (1999) found irrationality in decision-making. While making investment decisions, behavioural finance accounts consider the role of psychology, emotions, and cognitive error on investors. Rational investment decisions significantly impact the economy and have a significant role in shaping the market. All investors want to make rational decisions and profit continually, but the fear of loss in the future influences the investors to make decisions irrationally. Behavioural finance provides insights into biases and improves decision-making (Jain et al., 2020).

Talwar et al. (2021) examined the impact of eight behavioural biases such as overconfidence, self-assertive, excessively optimistic, hindsight bias, anchoring bias, herding behaviour, mental accounting (MA), and representativeness on the millennials' business activity and advocacy purposes during the COVID-19 pandemic. As revealed in this study, both business activity and advocacy purposes are influenced by the biases such as herding, hindsight bias, over-confidence and self-attribution, representativeness, and anchoring bias. Fatma et al. (2021) surveyed the impact of entrepreneurs' psychological biases on their successful ventures. Overconfidence, optimism, and hope have a massive impact on new ventures launched by female entrepreneurs than males. Pradhan (2021) described human beings as rational, but because of learning disabilities, they act irrationally, which is combined with other factors like emotions and feelings. After empirical analysis of the data of individuals living in UAE, results found that investors are influenced by emotional bias and feelings. Jain et al. (2021) analysed the literature on behavioural biases using bibliometric analysis and content analysis to provide insights and a roadmap.

Gupta and Shrivastava (2022) examined the impact of biases like loss aversion and herding on investment decisions by mediating the role of fear of missing out (FOMO) and found that FOMO partially mediates these biases and helps influence investors. Kamran et al. (2020) and Rasheed et al. (2018) documented a positive impact of availability and representative biases on Pakistan investors' decisions but could not find the mediating role of locus of control. Jaiyeoba et al. (2020) described the biases and the behaviour of Malaysian retail and institutional investors. The outcome is similar between retail and institutional investors on representative heuristics, overconfidence bias, and anchoring bias but different in the case of religious bias and herding bias. Al-Dahan et al. (2019) empirically assessed the impact of cognitive and emotional bias on investment decisions by collecting data from the Iraq Stock Exchange, and the result found that all the investors are characterised by overconfidence bias and mentioned investment decisions are based on the available information without doing deep study and investigation. Wangzhou et al. (2021) showed the relationship between RA – regret aversion as cognitive bias and the sectors of real estate having information cascade bias on investment by the mediating variable like risk perception and moderators like financial literacy. They found the link between cognitive bias and investment decision-making intermediates with the help of mediating variables, whereas the resultant negative impact was found between financial literacy on behavioural biases and investment decisions.

Financial literacy harms behavioural biases and investment decisions. Sahi et al. (2013) investigated whether individual investors' various beliefs and preferences influence their financial investment decision. Linciano et al. (2018) described the significant role of financial information in the behaviour of Italian investors, which assesses complexities and usefulness and influences the factor risk perception. Gender, age, personality traits, and behavioural biases have significant roles that influence the behaviour of investors. Zahera and Bansal (2018) collected papers on behavioural biases and investment decisions to understand the emotions, sentiments, and behaviour of an individual, institutional investors, and financial advisors. The study specifically investigates the influence of persuasion techniques on investor choices. It provides valuable insights into the role of behavioural factors and psychological biases in shaping investor behaviour, shedding light on the interplay between human psychology and financial decision-making processes (Broietti et al., 2022; Mehregan et al., 2021; Ferreira and Dickason-Koekemoer, 2020; Bihari et al., 2023). After reviewing all the papers, this study found 17 different kinds of biases that affect behaviour and create interest among all the investors and readers to minimise the impact of biases.

In the current study, bibliometric analytical techniques and scientometric analysis were used to examine the behavioural biases and their relationship with an investment decision to contribute scientific knowledge in this field. The study describes the patterns of journals, authors, institutions, keywords, and documents related to the research area (Vanhala et al., 2020). This technique describes the interconnection among the articles based on the parameters like citations and co-citations by summarising the bibliographic set of documents. The most influential articles, journals, and the gradual progress in this area can be determined with the help of a bibliometric study (Jain et al., 2021; Saha et al., 2020). Owusu and Laryea (2022) explored how anchoring effects affect investor decision-making, specifically in mutual funds, and it also specified how gender and financial knowledge differ among them. Experimental research was carried out; it concluded that anchoring bias influenced the decision, and females observed more than their male counterparts. Sharma's (2019) study was associated with youngsters in the Delhi NCR region behavioural biases in their decision-making; they identified overconfidence, herding, and self-attribution biases. Over-confidence overshadows the other biases, and thus it found that biases do play a significant role in investment decisions among the young generation.

This study highlights the recently developed method to analyse the biases and try to answer some following questions.

R1 How has the literature on behavioural biases and investment decisions progressed?

R2 Which countries, organisations, and authors have actively participated in behavioural biases and investment decision research?

R3 What are the most highly cited journals and research topics that contributed expertise in behavioural biases and investment decisions?

R4 What is the emerging research theme on behavioural biases and investment decisions, providing its directions for further study?

This review addresses the research questions and, by answering these questions, explores the role of biases and investment decisions. These unique techniques are used to evaluate the existing literature and provide knowledge regarding this area. First, this study provides the theory of behavioural biases in the introduction. Second, this study provides a comprehensive understanding of the concept with the help of reviewing the previous literature. The next session describes all the addressed questions with the help of bibliometric analysis techniques. The study finally ends with implications, limitations, and further research.

2 Research methodology

This study considered bibliometric analysis to address the objective and describe the intellectual connection between the dynamic aspects of scientific research (Morris and Van der Veer Martens, 2008). Bibliometric mapping is an essential tool for a research topic in science mapping. It represents how individual documents, authors, organisations, countries, fields, disciplines, etc. are related (Small, 1999; Cobo et al., 2011b).

2.1 Samples

The samples in the form of kinds of literature for this study are collected from 2010 to 2022 from the most authoritative academic citation repository and especially the core collection of databases, i.e., the Web of Science (W-O-S) database. To explore more, we referred to the title, abstract, or keywords of behavioural finance and investment decision publications on the W-O-S and collected 1,110 nos. of relevant articles by 30th December 2021. The search was restricted to titles, abstracts, author keywords, and keywords. The first category consists of overconfidence (OC), loss aversion (LA), regret aversion (RA), herding behaviour (HB), psychological biases, cognitive biases, emotional biases, hindsight bias, representativeness, or anchoring, or gambler's fallacy, or MA, or disposition-effect, or risk-perception of investor, or gender effect. Moreover, the second set consists of all the interconnected words of investment like institutional investor's decision-making, individual investor's decision-making, equity investor's decision-making, investment decision-making, financial decision-making, individual investor's decisions, risk-taking courage, individual investor's performance level, performance in trading, investors in a mutual fund, or investment advisors.

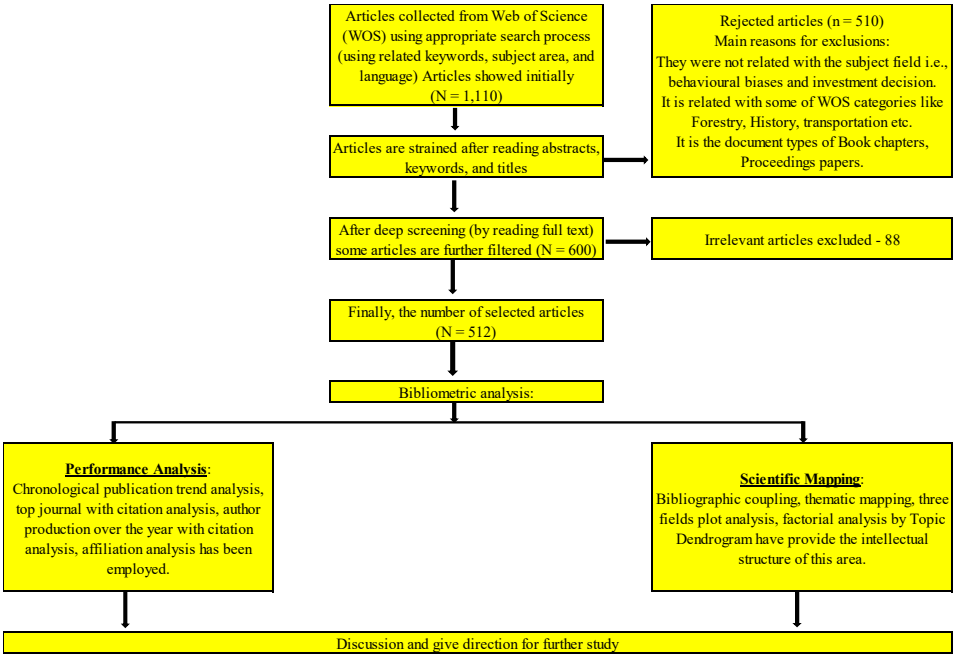
Moreover, the search process was confined to the subject field of business finance, economics, business, or management under W-O-S categories and documents of type-only articles selected based on the English language only for the review process from the publication year 2010 to 2022. Articles were filtered and examined by studying these articles and the screening process. Finally, 512 articles were selected based on the subject area of behavioural biases and investment decisions, and information like the article's title, authors name, journals name, country, affiliations, abstract, and references were collected for the evaluation.

2.2 Tools used

This study integrates the systematic literature review with bibliometric analysis to understand investors' behaviour patterns, analyse the connection between authors'

contributions, co-authorship, co-occurrence, citations, and bibliographic coupling, and provide possible predictions and support for making decisions before an investment. It gives knowledge about the annual study trends, journal, paper quality analysis, and citation analysis with the help of VOS viewer (1.6.15) and Bibliometrics R (3.0.0) tools. It is essential for providing evidence for questions (Rousseau et al., 2008).

Figure 1 Flow chart of methodological approach (see online version for colours)



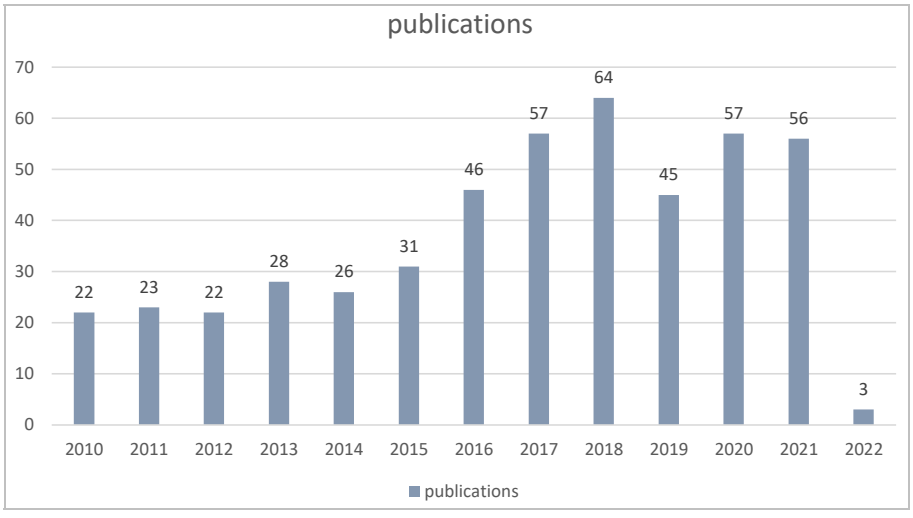
The flow chart in Figure 1 shows the steps of searching for articles, filtering, and selecting the final articles for further study. Bibliometric analysis is used to find the research questions raised above.

3 Results

3.1 Publication trend

Figure 2 describes the publication trend from 2010 to 2022 on behavioural finance and investment decisions. Numerous research papers gradually increased over time. From 2010 to 2015, the number of published papers was very few. In 2019, the number of publications, i.e., 64, was the highest. In the field of research, this topic is very bright and provides the intellectual connection and the vital role of biases to investors in their investment decision.

Figure 2 Publication trend in the field of behavioural finance (see online version for colours)



3.2 Top contributing journals with citations analysis

Bibliometric analysis discloses the citation of the most influential journals, authors, documents, and affiliations regarding behavioural biases and investment decisions. *Citation analysis* is the analysis that evaluates the citation used in a paper. It discloses the significance of this study (Garfield, 1972). Also observed is that the impact is more on heavily cited than less cited papers. Through this citation analysis, one researcher understands the significance of top influential papers and how their popularity has increased with time (Sharplin and Marby, 1985). Citation analysis is one the most popular and standard tools for analysing this research's top contributed and influential journals, authors, and documents (MacRoberts and MacRoberts, 2010).

Table 1 (Part-A) represents the topmost journals with the most publications on the behavioural biases and investment decision field, citations, and h-index. From the list of productive journals, the highest article having a journal is the *Journal of Behavioural Finance*, i.e., 22 articles which have 281 citations and score ten on the h-index. *Journal of Behavioural and Experimental Finance* is the second top journal with has 17-articles with 128 citations and an h-index of 8.

3.3 Affiliation analysis

Table 1 (Part-B) mentions the topmost country and highest number of documents with their citations. It shows that the USA is the number one country with the highest number of documents, i.e., 233 with 3,472 citations, followed by China with 176 articles with 796 citations. Other topmost countries are Germany, UK, India, Pakistan, Netherlands, Malaysia, Australia, and France, mentioned in their published documents with several citations.

Table 1A Highest productive journals

Sl. no.	*Journals*	*No. of articles*	*H-index*	*TC*
1	European Journal of Finance	9	5	61
2	Journal of Asian Finance Economics and Business	10	3	31
3	Journal of Banking and Finance	15	12	417
4	Journal of Behavioural and Experimental Finance	17	8	128
5	Journal of Behavioural Finance	22	10	281
6	Journal of Corporate Finance	7	5	138
7	Journal of Economic Behaviour and Organisation	13	7	127
8	Journal of Economic Perspective	4	4	266
9	Journal of Finance	4	4	677
10	Journal of Financial Economics	8	8	1,033
11	Managerial Finance	9	4	50
12	Pacific-Basin Finance Journal	10	7	182
13	Qualitative Research in Financial Markets	11	6	83
14	Review of Behavioural Finance	12	3	58
15	Review of Financial Studies	5	5	167

Table 1B Country-wise highest publication trend

Sl. no.	*Country*	*Documents*	*Citations*
1	United States	233	3,472
2	China	176	796
3	Germany	86	637
4	United Kingdom	85	400
5	India	75	238
6	Pakistan	33	64
7	Netherlands	30	256
8	Malaysia	29	68
9	Australia	25	53
10	France	21	172

3.4 Authors' influence

Table 1 (Part-C) mentions the top 15 authors and their contributions to this subject area with their citations mentioned. Author Tan S.H. is the most influential author who contributed the most articles, i.e., seven and followed by authors Khan M.T.I. contributed six, and Hoffmann A.O.I has five documents. From the list of top authors, Hirshleifer D. contributed two documents but has the highest citations, i.e., 618.

Citation analysis analyses the influence, pattern, and impact of an author, an article, or sources and provides the significance of existing literature. It measures by counting the number of times that others have cited authors' works, articles, or publications in their

works. Table 1 (Part-D) explains the top ten authors' local and global cited papers. The score between local and global citations differs from the table. The citation of papers within the collection is the local citation score. Hirshleifer has the highest number of local and global cited papers, i.e., 53 and 546, followed by Galasso with 33 local citations, but the global citation (285) is less than others like Huang and Schrand, who have 410 and 300 citations. Huang and Schrand have fewer local citations (i.e., 13 and 20) than Galasso. The list of remaining top author papers by local citation is mentioned in Table 1 (Part-D).

Table 1C Authors' highest productions over time with citations

Sl. no.	*Author*	*Documents*	*Citations*
1	Tan S.H	7	27
2	Khan M.T.I	6	11
3	Hoffmann A.O.I	5	213
4	Weber M.	5	204
5	Merkle C.	4	118
6	Ahmad M.	4	33
7	Demirer R.	4	14
8	Gupta S.	4	19
9	Kumar S.	4	40
10	Post T.	4	221
11	Sahi S.K.	3	62
12	Hirshleifer D.	2	618
13	Arora A.P.	2	46
14	Chen J.	2	49
15	Patel P.C.	1	617

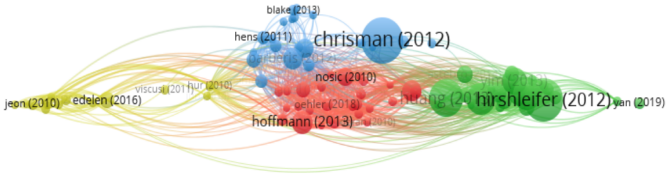
Table 1D Top papers by local citations

Sl. no.	*Author (Year)*	*Local citations*	*Global citations*
1	Hirshleifer D. (2012)	53	546
2	Galasso A. (2011)	33	285
3	Deshmukh S. (2013)	25	101
4	Schrand C.M. (2012)	20	300
5	Huang W. (2011)	13	70
6	Hoffmann A.O.I. (2013)	12	156
7	Nosic A. (2010)	12	103
8	Huang J. (2013)	10	411
9	Yim S. (2013)	10	210
10	Barberis N. (2012)	10	138

3.5 Bibliographical coupling

Bibliographic coupling is a method introduced by Kessler (1963). It is the process of grouping scientific papers. When a single work of reference is used by two papers in their work to describe a particular concept, then there is a relationship built up, and that relationship is known as bibliographic coupling. It expresses the similarity in papers (Kessler, 1963). It helps to gain knowledge and understand the pattern of development in research. So that one can proceed with the work or the publisher's future demand. It is an excellent tool for authors, researchers, libraries, and publishers to expand their knowledge for the future research process. Bibliographic coupling introduces another topic which is co-citation (Small, 1973). It links the cited documents and observes the pattern of direct citations from a citation index like the science citation index. Figure 4 describes the 88 documents with a minimum number of citations, i.e., 20, to examine the strength of links between the documents. Chrisman has 617, the highest citation with a total link strength of 82, followed by Hirshleifer and Haung, having 546 and 411 citations, and their total link strengths are 160 and 104. The number of documents is divided into four clusters. Cluster 1 (red colour) consists of 27 items, such as Daniel, Hoffman, Nosic, Baker, Oehler, etc. and primarily describes the behavioural bias of overconfidence and disposition effect.

Figure 3 Bibliographic coupling of documents (see online version for colours)



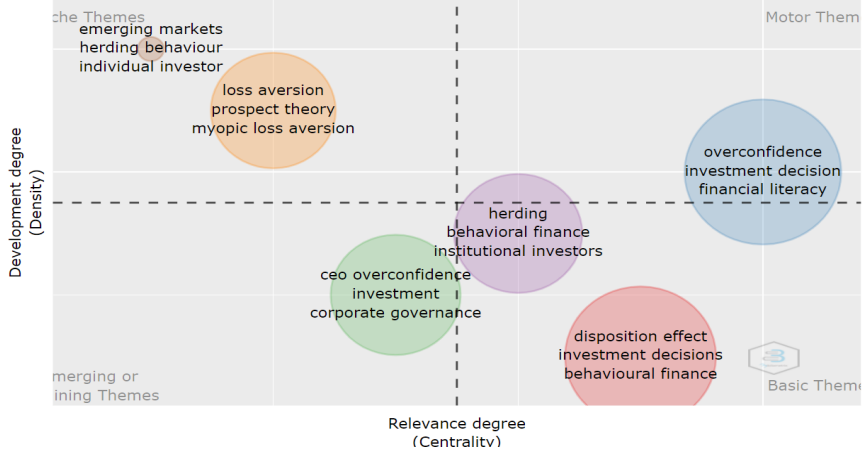
Cluster 2 (green colour) consists of 25 documents such as Galasso, Chen, Ham, Aktas, Hirshleifer, Huang, etc. explaining investment efficiency, how the investment decision differs based on gender, and the behaviour of investors. Cluster 3 (blue colour) consists of 21 items, such as Blake, Hens, Lian, Posen, Chrisman, etc. describing the biases like loss aversion, cognitive dissonance, and prospect theory. Cluster 4 (yellow colour) consists of 15 documents like Jeon, Edelen, Viscusi, Cai, Hur, etc. describing the bias like herding behaviour and heterogeneous investors' sentiment.

3.6 Thematic mapping

The bibliometric data frame creates a thematic map to analyse the network between co-words and cluster them (Aria and Cuccurullo, 2017). This method was influenced, and its evolution was described by Cobo et al. (2011a) to measure the most important, productive, and highest impact sub-fields in research. This study considered the authors' keywords to understand the structure and research theme through the thematic map. Figure 4 shows the thematic map of the authors' keywords, and in the upper-right quadrant, the words like overconfidence, investment decision, and financial literacy have strong centrality and high density in the research field. This quadrant is also known as motor themes. Upper-left quadrant consists of emerging markets, and individual investors and herding behaviour are well-developed for internal ties only. These are less important

for research, and this quadrant is known as highly advanced and separated concepts. Lower-left quadrant consists of the disposition effect, herding, and institutional investors are explained as weakly developed and of marginal importance for the research field. This lower-left quadrant is also known as emerging or declining themes. Moreover, the lower-right quadrant, also known as the primary themes, consists of overconfidence, corporate governance, and investment, which is essential for research but has yet to be developed (Secinaro et al., 2021).

Figure 4 Thematic map (see online version for colours)



Overconfidence had been found as a factor in the theme causing irrational decisions of investors. Researchers found that overconfidence plays a significant role in investment decision-making increases. Overconfidence increases market efficiency and promotes the over or undervaluation of assets. Individual investors often practice and follow overconfidence biases for making an investment decision, so the financial literacy of investors has a significant effect on the investment decision. Researchers have worked empirically on biases and specified disposition effects, and institutional investors are related to each other. Investors having more experience are less affected by the disposition effect, whereas less experienced have the effect of disposition. The disposition effect links stock market return, volatility, and trading volume. Trading experience in the financial market can reduce the area of the disposition effect. Herding behaviour is found among investors. Investors use brokerage houses and other peer groups to enhance their investment decisions. Many researchers provided evidence of herding bias in the investment decision, the accuracy of analyst earnings forecast, and herding behaviour. Herding is more in the Indian stock market as compared to other markets. CEO overconfidence can also account for investment turmoil. Overconfident managers overestimate their ROI; thus, an overconfident CEO is more responsive to cash flow. The CEO overestimates. Corporate governance also exaggerates the impact of investor confidence on corporate investment decisions; good governance leads to better management, and thus investment decisions are more effective. Individual investors are more overconfident than institutional investors. Loss aversion is being explored from prospect theory. Researchers have used prospect theory to understand decisions made by

investors. They rely on normative models based on specific criteria to maximise the utility function.

3.7 Three-fields plot analysis

Figure 5 shows the three-field plot, and this study took authors in the left field, keywords in the middle field, and sources in the right field. A Sankey diagram describes how authors, their keywords, and sources are related to the bibliographic data. From the figure, the keyword overconfidence has the highest incoming flow, i.e., ten, and an outgoing flow count of 20. The disposition effect has the second highest. Gupta and Hoffman gave more contributions to this research field from the list of authors. Similarly, the source *Journal of Behavioural Finance* published most behavioural finance studies, followed by the *Journal of Economic Behaviour and Organisation* and the *Journal of Behavioural* and *Experimental Finance* have contributed to this research.

3.8 Factorial analysis

The dendrogram is the graphical tool that observes the hierarchical relationship between keywords. It is a tree-structured graph that describes the cluster calculation. It explains the similarities present between the group and helps to understand the data in a faster way.

Figure 5 Three-fields plot analysis (see online version for colours)

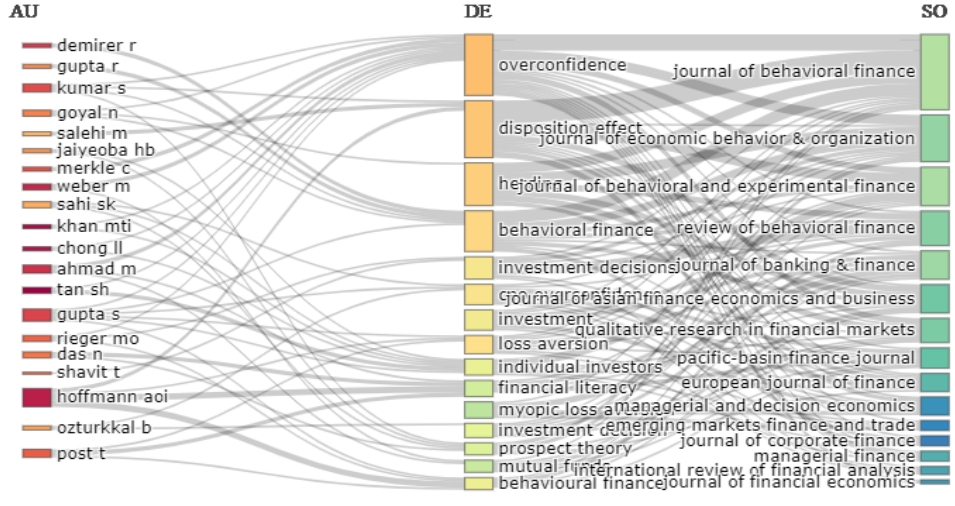
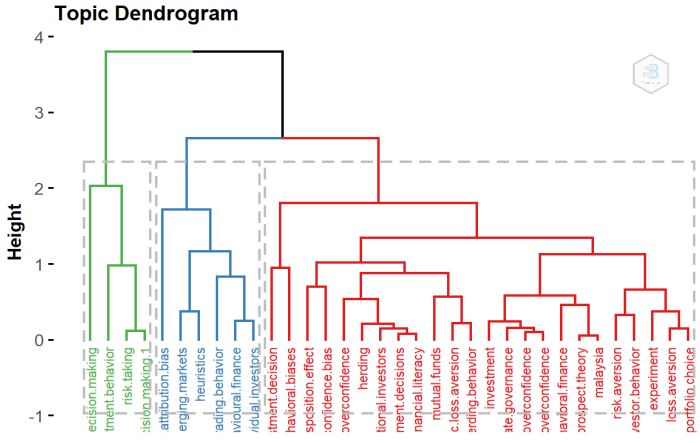


Figure 6 shows three clusters with the colours red, blue, and green present. It is used to identify the objects and assign them to clusters by calculating the height and how they are linked with the divisions (Secinaro et al., 2021). Cluster 1 (red) includes the 24 keywords like overconfidence, disposition effect, herding, behavioural biases, investor behaviour, etc. after that, the closest distance is followed by six keywords like heuristics, emerging market, trading behaviour, etc. say cluster 2 (blue). Then the distance between

risk-taking, decision-making, and investor behaviour is considered under cluster 3 (green).

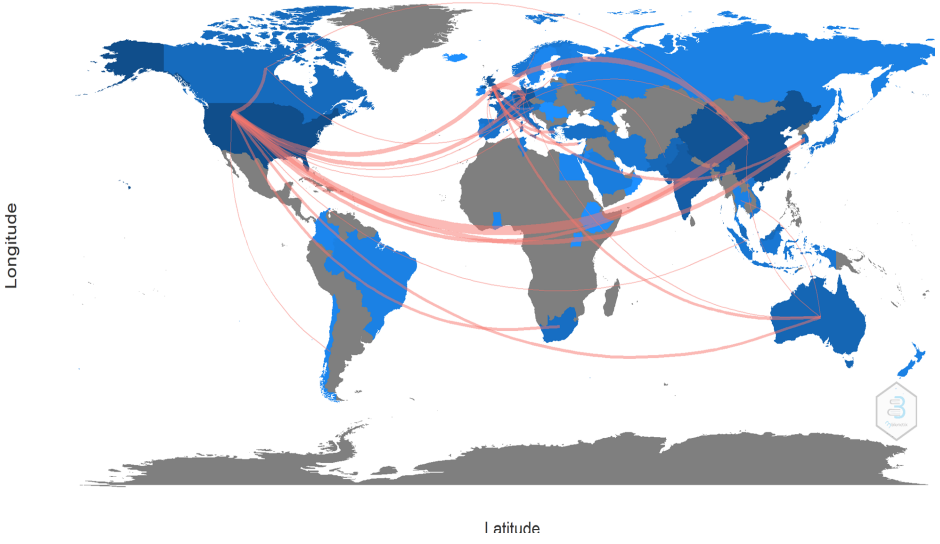
Figure 6 Topic dendrogram (see online version for colours)



3.9 Country collaboration world map

Figure 7 show that various countries published several documents on behavioural biases and investment decisions. The results were reflected based on countries' productions.

Figure 7 Collaboration world map (see online version for colours)

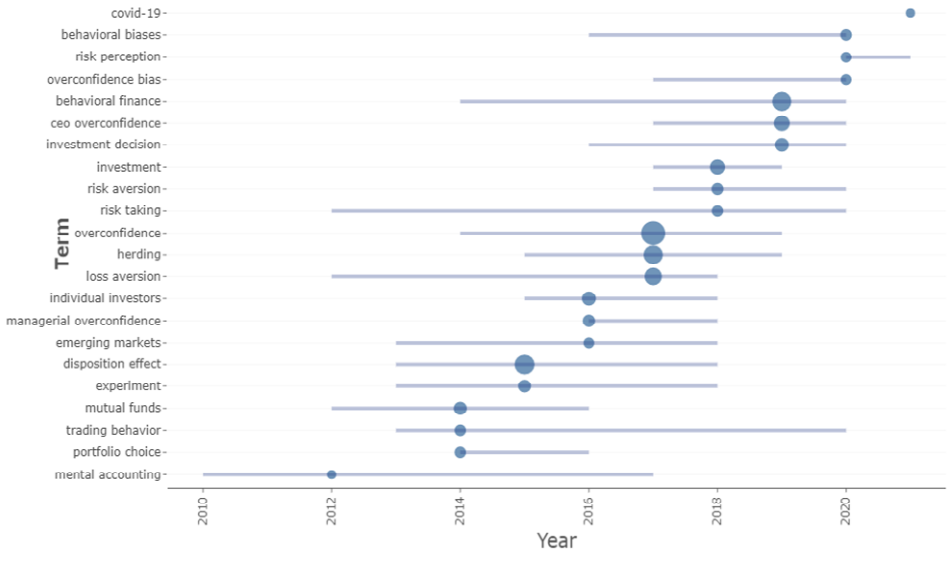


Source: Bibliometrix R-package

The USA has the highest number of contributions, i.e., 233, followed by China (176), Germany (86), the UK (85), and India (75). India needs to put more effort into this

subject area. India contributes significantly less than developed countries like the USA and China.

Figure 8 Trend topic based on author keywords from the period 2010–2022 (see online version for colours)



4 Discussion

Systematic literature review and bibliometric analysis were conducted to analyse the research trends in behavioural biases and investment decisions and segregate the documents into different clusters to observe their theme and association and provide the gap for further research. This analysis mentioned top cited documents, authors, institutions, and their collaboration in this field. To observe the link and strength among documents, conducted bibliographic coupling that makes the documents into four clusters. A thematic map was also conducted to observe the internal strength and external linkage between the authors' keywords of the articles. From the statistical data of publication trends, we observed that from 2016 the number of publications has increased.

Moreover, the published documents mention the top 15 influential journals with their publication. Moreover, the *Journal of Behavioural Finance* is the top journal with the most published documents. Nevertheless, the source *Journal of Financial Economics* has the highest number of citations. The descriptive analysis found that the top author Tan S.H. published the highest number of documents in this field. Furthermore, the USA is the top country that publishes the highest number of documents with citations. To assess the significance of the literature based on the citation, mention the top ten cited authors, among which the author's documents (Hirshleifer, 2012) have the highest number of both local and global citations. Four clusters were formed from the bibliometric coupling result through VOS viewer to show the linkage and coupling strength among articles.

4.1 Analysis of the behavioural finance

Investors should learn how to identify their mistakes, realise them, and take proper steps to avoid them. Behavioural finance explains the question of an individual what, why, and how to invest in finance (Brooks and Byene, 2008). Numerous biases and theories were identified through the review process, such as prospect theory, heuristics, emotional biases, etc.

4.2 Prospect theory

The prospect theory explains how an individual's decision depends upon perceived losses or gains when they have several alternatives that include risk and uncertainty. Daniel Kahneman and Amos Tversky, both psychologists, proposed this prospect theory in 1979. It includes the mental states that affect the investment process and is justified by the bias like loss aversion (LA), regret aversion (RA), and MA (Konstantinidis et al., 2012).

The cognitive bias loss aversion describes the psychological power of the pain of losing as twice the satisfaction of gaining, and this significantly influences the investors to make bad decisions (Kahneman et al., 1991), thus leading to erroneous results where losses and gains are unstable. The review process found that many investors were influenced by loss aversion bias for making irrational investment decisions. Loss aversion occurs due to experience, and if one investor made a good profit in the past from an investment, the investor chooses that risky option again (Barberis et al., 2001). Research has found that the loss aversion bias presents more in female than male investors (Hassan et al., 2014). Many people make decisions only because they fear missing out on the alternative option and might regret it later. Sometimes people think less about making good decisions and more focus on avoiding the lousy option to not regretting in the future. This sense of regret is known as regret aversion and was proposed by Loomes and Sugden (1982). After deciding under uncertainty, an investor thinks that the alternative option would have been superior, which creates a sense of fear of loss or regret (Bell, 1982). Optimal currency hedging choices are based on the regret theory to find solutions and consider the risk and regret before deciding (Michenaud and Solnik, 2008). Regret aversion influences the CAPM, so one can make a suitable portfolio for maximising return before investing and design a framework regret-based CAPM to understand the effect of regret aversion (Qin, 2020). Researchers found that regret aversion significantly impacts investment decision-making (Khan, 2017; Jain et al., 2020).

When people have different values and treat their own money into different accounts, that affects the investors in decision making, which gives detrimental results known as MA bias proposed by economist Nobel Prize-winning Richard Thaler in 1999 (Thaler, 1999) to evaluate the decision choices and the activities of accounts, the psychology of the MA approach regulated the decision-making (Sattar et al., 2020).

4.3 Heuristics

An investor used various shortcut methods to solve the problems quickly and effectively. These strategies are the rules-of-thumb, which try to make a quick judgement by reducing the cognitive load, known as heuristics, proposed by Tversky and Kahneman (1974). Such kinds of biases occur in the judgement of probability. Heuristics lead to biases like availability, representativeness, and anchoring (Tversky and Kahneman, 1974).

The availability bias is a cognitive error or a mental shortcut where an individual mistakenly believes that a recent event will happen again (Tversky and Kahneman, 1974). Investors are quickly making investment decisions based on information availability without analysing an event's depth scenario (Shah et al., 2018). Those investors have availability bias, failing to make portfolios or appropriate asset allotment; they cannot make rational decisions. Studies by Javed et al. (2017) and Rasheed et al. (2018) found a positive effect of availability heuristic bias on investment decisions. At the same time, Rehan and Umer (2017) disagree with the positive significant results. The researchers Salman et al. (2021) considered risk tolerance as the mediator between the availability heuristic bias and investment decision-making. The relationship between them was positively significant.

Representative bias is a cognitive bias, proposed by Kahneman and Tversky (1979), where people mostly rely on recent activities that influence them to make irrelevant decisions (Ritter, 2003). They depend on stereotypes while making decisions and fail to consider the available information into account (Shefrin, 2005). The bias is a mental shortcut where people cannot understand the basic forecasting concepts. Some people mistakenly believe that if we draw a small sample for collecting the information, it represents the entire population. Furthermore, it gives wrong results when decision-makers try to generalise only based on a few samples (Barberis and Thaler, 2003; Pompian, 2006). Prior studies had emphasised representative bias regarding the investment decision. Novianggie and Asandimitra (2019), Irshad et al. (2016), Rehan and Umer (2017), and Javed et al. (2017) found a strong association between representativeness bias and investment decisions, whereas Athur (2014) and Xue et al. (2015) could not visualise such association between them.

Before composing any plan, some individuals use prime focus or anchor as a reference. They heavily focus on the first piece of information instead of observing the actual objects, which may misrepresent our judgement, known as anchoring bias stated by Kahneman and Tversky (1979). Lowies et al. (2016) found that anchoring has a significant effect on property fund managers' decisions, and other studies (Ishfaq and Anjum, 2015; Abraham et al., 2014) show that anchoring bias affected the investment decision. Some research concluded that sometimes the result differs from the above and identified the negative impact of anchoring bias on decision-making (Latham et al., 2008).

Overconfidence bias occurs when one individual mainly relies on information, ideas, skills, and abilities rather than analysing the facts (De Bondt and Thaler, 1995). Overconfidence is a cognitive heuristic bias with three key aspects, i.e., overestimation, over-placement, and precision (Moore and Healy, 2008). People mostly undervalue their skills and overvalue what they do not have due to overconfidence bias (Chernoff, 2010). The literature review revealed that overconfident heuristic bias has a different impact on decision-making; sometimes, it is positive or negative. Due to the overestimation of own knowledge and skills studies by Antony and Joseph (2017), Budiarto and Susanti (2017), Jain et al. (2020), Parhi and Pal (2022), and Quaicoe and Eleke-Aboagye (2021) found a significant impact on investment decisions. In contrast, the study by Kafayat (2014), Waweru et al. (2008), Kengatharan and Kengatharan (2014), and Park et al. (2010) found a negative impact on investment decisions.

4.4 Direction for future research

The study identified behavioural finance as an emerging research area, a substitute of modern finance for new research based on the irrationality of investors, and trying to explain the various confusion in the financial markets, which is especially relevant in the global market scenario. The contribution of this work identified various themes of emerging research areas. Hot research areas identified in the financial field are highly influenced by psychology, economics, and sociology. The essential theme identified in behavioural finance is the study of overconfidence bias in the decision-making process. Future research in this line will allow proceeding, in theory, building that integrates with behavioural finance. The insights from the research revealed several issues raised by the researcher and from our research, which will help in the design and development behavioural finance framework for future research to contribute to the existing knowledge base from the viewpoint of academic and industry-oriented research. The analysis of documents examined the gap in recent articles, which is essential for further analysis. Today's era is the Artificial Intelligence era. Robo-advisory tools and services are essential in this modern industry AI era. These Robo-advising tools do not require the advice of financial experts to reduce biases. The service of Robo-advisor tools helps reduce the behavioural biases the authors proved (Bhatia et al., 2021). Thus, there need to be more experimental studies on Robo-advisory services which will help investors by reducing their biases while making an investment decision. Variables identified are suggested that can affect the investment decision by investors and provide a direction and road map for the future researcher to focus. Thus, it parallels the idea focused on by (Biancone et al., 2020). A researcher should focus on a simulation environment involving different questions in the investors' minds concentrating on influencing the biases for an investment decision. Game and role-playing with the cognitive and emotional thinking process can be explored to provide better and idealistic insights in this direction by the further researcher as being aligned (Kumar and Goyal, 2015). Another direction for further research exploration will be in experimental design involving cross-cultural investors to find out the way different investors from different regions and cultures respond to biases and in knowing their perception towards investment in a risk environment and considering the impact of social network influence in the bias's idea being aligned by (Valcanover et al., 2020).

Based on the trend from 2010–2022 and considering the different articles with the author keywords, the significant biases identified are overconfidence, risk aversion, loss aversion, disposition effect, and MA. It is essential to gain more knowledge about investors in India and the role of behavioural biases in their investment decision-making.

The trends provide knowledge in identifying the following gaps examining extensive literature review:

1 To identify behaviour biases among investors and their role in investment decision making.

2 To measure the impact of behavioural biases on investment decisions by investors.

3 To suggest managerial implications in minimising biases and improving investment decisions.

5 Conclusions

This current study analyses the framework and pattern of the existing literature, which contributes to various kinds of literature on behavioural finance. After deeply screening the articles, the final number of articles was selected. In the first step, performance analysis is to analyse the publication trend, authors and country's contribution, citation analysis of authors and documents, and affiliation analysis. Secondly, scientific mapping helps to analyse the connection between authors' keywords, authors, and sources through bibliographic coupling, thematic mapping, and three fields of plot analysis. It also provides the intellectual structure of this area. The third step explained the role of biases and their impact on investment decisions, emphasising future research agendas. This study discloses the evolution and trend of literature and contributes knowledge regarding biases to investors. The study added to the knowledge base of behavioural biases and their impact. It also provides a roadmap where further research can be carried out. This study has some limitations also, i.e., the present study only considers articles but ignores books, conference proceedings, and non-peer-reviewed journals. Another one is only considering the articles from 2010 to 2022 and ignoring the papers published before 2010. The exclusion of these resources may provide more valuable results.

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