

# Exploring Behavioural Bias Affecting Investment Decision Making: A Network Cluster Based Conceptual Analysis for Future Research

## Abstract

**Purpose:** This study systematically explores the patterns and connections in the behavioural bias and investment decisions of existing literature in the SCOPUS database published between 2007 and 2022.

**Design/methodology/approach:** Deep screening precedes our application of a systematic literature review and bibliometric analysis, allowing us to examine the content of 27 research works that are most relevant to our topic. With the assistance of bibliometric analysis, the most important documents contributed by authors, nations, and journals, as well as their citations, the relation between keywords and authors, and an analysis of the worldwide collaboration of countries are all included. This study analyses the trends, the intellectual structure, and provides directions for the future of academic research.

**Findings:** In the article, it was determined which contributed documents were the most significant in this particular subject area, along with the citations, publications, and nations that were associated with them. The bibliographic coupling offered more in-depth insights into the papers by organizing them into distinct groups. The pattern of the publications has been brought to light, and the connection between different types of literature has provided insight into the path that future studies should take.

**Research limitations/implications:** This study considered only articles from the SCOPUS database. Future studies can be based on papers that have been published in other databases.

**Originality/Value:** The outcome of this study provides valuable insights into the intellectual structure and biases of investors and adds value to existing knowledge. This review provides a road map for the future trend of research on behavioural bias and investment decisions.

**Keywords:** Behavioural biases; Emotional bias; Cognitive bias; Systematic literature review; Investment decision making.

## 1. Introduction

Traditional economic theory assumes that investors behave rationally while making various kinds of decisions (Muhammad and Maheran, 2009). Standard financial practice consists of various concepts and theories e.g. the expected utility theory (Bernoulli, 1738), Markowitz portfolio principles (Markowitz, 1952), the capital asset pricing model (Treynor, 1961) etc., to explain the efficiency of the market that contains all the available information while taking financial decisions; investors are assumed to be rational (Zahera and Bansal, 2018; Kumar and Goyal, 2015). Although all of the above theories are widely accepted by researchers, they have failed to provide answers to some questions, such as the causes of market bubbles and crashes and which variables are to blame for unpredictable situations (Sharma and Kumar, 2019; Zahera and Bansal, 2018). After analysing the results, they found that the role of behavioural finance, which contradicts all the standard theories of concepts and assumptions of rational

investors, always leads to an optimal financial decision. Human emotions, attitudes, and psychological biases that influence investors' decisions, tend to be inefficient and irrational (Kahneman and Tversky, 1982; Kapoor and Prosad, 2017). Thus, in the 1980s, a new perspective on finance, i.e. behavioural finance, emerged from psychology, finance, and sociology; this deals with the psyche of investors and also attempts to describe the impact of psychological errors on their decision-making process (Kahneman and Tversky, 1979; Kishor, 2020). Behavioural finance examines the puzzling behavioural aspects of individuals operating in financial markets while considering their emotions, psychology, sociology, and other related factors. The emphasis is on the various behaviours shown by investors and how these behaviours influence the investors (Yoong and Ferreira, 2013). The introduction of prospect theory, which replaces the expected utility traditional theory, is one of the major steps in the shift from the traditional concept to the modern concept of behavioural finance (Kahneman and Tversky, 1979). There have been many empirical studies conducted to solve the questions raised about traditional finance. Examinations have been conducted to identify the relationships between behavioural factors and classical factors and how they influence investment decision-making (Masood et al., 2010). Prior literature has found that the behavioural factors are affected by two major areas i.e. prospect theory and heuristics. The characteristics of these areas are explained through different kinds of biases, including loss aversion bias, risk aversion bias, regret aversion bias, mental accounting, overconfidence, self-control bias, herding behaviour etc. Studies have explored and shown that the biases of overconfidence, expert bias, and self-control bias have a positive significant impact on individual investors' behaviour, influencing their financial satisfaction levels (Sahi, 2017). A recent study, conducted with the help of an analytical hierarchy process, analysed behavioural factors such as overconfidence bias, representative bias, regret aversion, mental accounting, and herd behaviour affecting investment decisions. The result concluded that bias overconfidence and regret aversion impact were much stronger than other biases (Antony and Joseph, 2017). A similar study was conducted by Almansour and Arabyat (2017).

Various studies have been published in the subject area of behavioural biases and investment decisions (Kumar and Goyal, 2015; Jain et al., 2020; Rasheed et al., 2018). There is a need to analyse the strength and association between the articles published in this area. Thus, the present study focuses on bridging the gap between the works of literature through bibliometric analysis, providing an intellectual structure in this area. To bridge this gap, the following questions are presented:

**RQ1:** What is the publication trend in the area of behavioural biases and investment decisions? Year-wise, what was the greatest contribution made by authors, journals, and countries?

**RQ2:** Based on citations (co-authorship, co-occurrence, and bibliographic coupling), what are the most important documents?

**RQ3:** What are the emerging research themes on behavioural biases?

**RQ4:** What are the directions for future research?

This provides a comprehensive review of behavioural biases and investment decision-making. The paper applies the following structure:

- Explore how documents about behavioural biases and how they affect investment decisions are linked.

- Understanding the adoption of SLR methodology by searching different databases and classifications.
- Explain the research gap, findings, and recommendations for a future research roadmap in behavioural finance.

In this article, the introduction is followed by the literature review in section 2; this reviews previous studies on behavioural bias, investment decision making, and the factors influencing the investment decision-making behaviour of investors. Section 3 provides a brief discussion of the methodology adopted in this research. Section 4 discusses the results of bibliometric analysis, followed by Section 5 that reports on emerging research agendas. Section 6 discusses the key findings and implications of the study. Concluding remarks are provided in section 7. Section 8 presents the limitations and future direction of this study.

## **2. Literature Review**

Scholars have used a variety of methods to review literature i.e. meta-analysis, weight analysis, scoping review, systematic literature review (SLR), and narrative review. The present research study is an integration of systematic literature review and bibliometric analysis techniques, facilitating the identification of intellectual structure. The paper has looked at a systematic literature review of the past 33 years regarding biases that impact investment decision-making. The main purpose is to analyse behavioural biases like herding, home bias, overconfidence, and disposition effects of investors and their impact on returns, volatility, and portfolio selection. This will provide a roadmap for future research.

The purpose of this research is to gain an understanding of the various behavioural biases that influence investors' investing decisions as well as the socio-economic factors that are taken into consideration; this is done by utilizing SLR and meta-analysis. 17 types of bias and 15 socio-economic items were identified in the outcome data set. The findings revealed that there was an interrelationship between behavioural biases and common biases like disposition and overconfidence (Sharma and Nandi, 2018). A few studies also found that there is a strong correlation between behavioural biases and socio-economic variables in different geographical areas (Calzadilla, Bordonado-Bermejo, and González-Rodrigo, 2021; Quaicoe and Eleke-Aboagye, 2021; Ahmad, 2021). Research by Fischer and Lehner (2021) focuses on behavioural finance and its development by systematic literature from 36 finance journals published between 2009 and 2019; they set out to explore the field of neuro-finance and the human brain. Their research also analyses the impact of behavioural bias on rational investment decisions. The research work by Clark et al., (2019) focuses on foreign and domestic bias and portfolios in a bond market. They observe that foreign investors have a good return policy only because of their behaviour. Foreign investors have enough ideas to avoid the uncertainty and controlled volatility of the bond market. This paper provides insights into emerging markets so that investors can observe the behaviour of foreign investors and make wise decisions. Scholarly works by Pradhan (2021), and Ritika and Kishor, (2020), examined the impact of both financial literacy and behavioural biases like heuristic bias, herd mentality, framing effect, and cognitive illusion on investment decisions. Their findings confirmed the existence of a significant positive association between heuristic bias and investment decisions. The study also found that there is a negative link between the framing effect, the herd mentality, and cognitive illusions and investment decisions. It came to the conclusion that financial literacy has a significant effect on investment decisions in the stock market.

A recent research paper by Bhatia et al. (2021) analysed the theories of traditional finance and behavioural finance that are generated based on behavioural aspects. The authors' objective is to make all investors aware of the psychological factors and their impact on rational decision-making. Studies by Sharma et al. (2021) as well as Dangi and Kohli (2018) focus on the investment decisions of women entrepreneurs and attempt to explore the way women's behaviour affects their investment decisions. Kappal and Rastogi (2020) examined behavioural biases such as disposition effect, herding effect, and overconfidence bias and their impact on investment decisions using a moderating role i.e. investor type. Their results indicated that the moderating role is positive in overconfidence bias and negative in herding effect while making investment decisions. Research work by Lather et al. (2020) focuses on biases like overconfidence bias, reference point bias, self-attribution bias, framing effect bias, regret avoidance bias, and overreaction among male and female investors and their impact on investment decisions. The study observed that the impact of gender was significant on overconfidence bias, self-attribution bias, and regret avoidance bias. A study by Hassan (2013) explains how the theory of traditional finance is different from modern theory after observing the behaviour of people. The study explores positive and negative aspects of biases and also the way they are related to the financial satisfaction of individuals. The results were found to be positive and significant in the case of biases like overconfidence, reliance on expert bias, and self-control. A study by Sahi (2017) considered both individual investors and professional investors and investigated their investment decisions by comparing them using different techniques and tools. They discovered that long-term investment decisions have 1.5 times the impact of short-term decisions. Short-term investors are being affected by heuristic biases. Heuristic bias affects investors in analysing their current financing situation and previous experience that shows how to deal with the behavioural biases for making rational decisions (Rauwerda and De Graaf, 2021).

We have utilized an organized procedure in order to locate the relevant literature. The intellectual dynamics of the research area can be better understood after science mapping has been carried out with the assistance of bibliometric tools. In addition, investors, analysts, practitioners, and academics may find the comprehensive analysis of the content leadership, research gaps, and future research directions to be of great value.

### **3. Methodology**

SLR explores and offers a model for summarizing and critiquing literature to enhance the future research agenda. It is used as a standard for a roadmap to potential documents (Davis et al., 2014; Livinski et al., 2015). The systematic review adopts a common protocol and is carefully documented to be transparent to other researchers, enabling them to access results and thus helping to maintain external validity. It combines findings from various studies and reveals the trends, patterns, and themes in current literature from the available body of knowledge (Davis et al., 2014). This provides reliable outcomes by reducing the existing bias (Liberati et al., 2009). SLR is a means of consolidating knowledge about a specific topic or research question. It has been used in exploring relevant research based on a research question on a particular research method systematically. This provides the most clarity, validity and reliability in relevant studies in the area. It tries to reduce the biases that occur during the review of research evidence. SLR clarifies documents by defining their structure, document methods, and search process. SLR removes potential bias e.g. selection and publication. In order to avoid publication bias, we have included a wide range of reviews, including the years 2007–2022.

Accurate records are kept in order to provide an auditability feature that enables the review to be consistent and systematic throughout. Articles published in English have more citations than articles in other languages; they are dominant in the area of behavioural finance and also make English accessible to a wider audience. Many researchers communicate their results to the global community in English.

The period considered has shown a high growth in published articles and also citations, all of which have increased over the time period. Identifying the trends and topics may give vital insight to researchers in the domain of behavioural finance. A number of researchers discussed the selection of different databases, e.g. Scopus and WoS, for bibliometric analysis. Each database has its own advantages. As per the rule of thumb, all databases should be used, but this demands huge data cleaning and merging of databases. There are several reasons for the choice of Scopus databases. One is that the coverage of Scopus is relatively larger, with more citations of peer-reviewed articles. Scopus had more weightage than Google Scholar databases and more extensive research, whereas Google Scholar provides limited bibliometric information for bibliometric analysis (Corbet et al., 2019; Kumar et al., 2020; Clark et al., 2008).

The systematic review helps to create questions or hypotheses and collect and analyse data from studies to find solutions; it also identifies paths to further research. This study focuses on the SLR process and bibliometric analysis; this implies structured, transparent, reproducible, and iterative development in nature (Fischer and Lehner, 2021). Some keywords are required in the SLR process for the extraction of research articles. Primarily, data was provided by Scopus, the largest database that consists of abstracts and citations in the pertinent literature. To create the most relevant study, the searching process used a combination of title, abstract, and keyword. Furthermore, to understand the intellectual structure of this study, bibliometric analysis was used. To perform this bibliometric analysis, a variety of different pieces of software have been used. For this study, we used VOS Viewer to perform bibliometric analysis.

<Insert Figure 1>

During the process of searching, we will only take into consideration papers that have been published in Scopus journals and are written in English. The overall selection process that the researchers used in order to carry out the relevant investigations is depicted in Figure 1. From the published articles, the ones that do not have a full-text version, do not pertain to the subject at hand, or are articles such as conference papers, proceedings, and book chapters are not included in this research. The records that were imported in the '.csv' and '.bibtex' formats were disregarded for the sake of the subsequent study. In addition, selected articles were taken into consideration for additional bibliometric research.

## **4. Bibliometric Analysis**

### ***4.1 Data extraction process***

There are a total of 63 authors who have contributed to the publication of 27 articles in 20 reputable journals that have been subjected to peer review. These authors come from a wide variety of fields, including business, management, accounting, economics, econometrics,

finance plus arts and humanities. Sixty authors have contributed to multiple documents. In addition, there are just three authors who have a single research document.

<Insert Table 1>

<Insert Table 2>

The study activity that was associated with this topic began in 2007. From 2019, an upward trend was observed in the publication frequency. This results in a collaboration index of 2.5 between the authors. Annual scientific productivity is increasing at a rate of 27.54 percent per year. Bibliometric analysis was used to obtain this information.

<Insert Figure 2>

Behavioural biases and their influence on financial decisions are increasingly becoming the focus of attention among researchers and other experts, who endeavour to better understand both. In both of the years 2020 and 2021, there are a total of seven articles published. It was also observed that in addition, three articles were published in 2019. This indicates a greater emphasis being placed on research in this sector beginning in 2019.

<Insert Figure 3>

In this field, most of the research work was done in India ( $n = 51$ ) followed by Iraq and Pakistan ( $n = 3$ ). But if we observe citations of the paper, then USA, i.e. ( $n = 2$ ) with 215, has the highest number of citations compared to India (119) and Pakistan (5). In contrast, the publications from China and other remaining countries are not able to create sufficient citations. It is essential to understand how behavioural biases influence investors in making investment decisions.

#### ***4.2 Most Influential Works***

<Insert Table 3>

These chosen papers are listed in Table 3, in ascending order of the number of citations they received. In addition, the author's name, the title of the work, the journal in which it was published, and the h-index of the publication are given. This knowledge is very important to pave the way for new research directions for those working on this subject. The material also sheds light on the author's contributions to their work in this field and provides insights into those contributions. In addition, the name of the journal that contains highly referenced works is also stated. When it comes to obtaining useful information, one of the best sources is found in highly referenced publications. Knowledge regarding behavioural biases and investing choices can be gained by analysis of those papers that have received a significant number of citations. The authors highlight the illogical investment decisions that are made by investors due to their biases (Chen et al., 2007). As a result, this creates a direction for researchers to explore more deeply with the assistance of existing frameworks and even tries to extend the framework with a new construct after identifying a gap that is presented in the previous paper (Kumar and Goyal, 2015). A number of researchers then improved and broadened the scope of the study by incorporating both primary and secondary data, as well as a wide variety of tools,

methods, and more advanced levels of statistical analysis. This was done in an effort to validate the underlying framework and theory (Singh et al., 2016; Sharma and Nandi, 2018; Zahera and Bansal, 2019; Kappal and Rastogi, 2020; Abdullah and Khan, 2021; Barber and Odean, 2001; Fischer and Lehner, 2021). The scope of the research was expanded to include looking into how investors think and how they do business. This helped to develop a theory and build a structure using advanced statistical skills.

To analyse the relationships between co-author, co-occurrence, co-citation analysis, and bibliographic coupling, we used VOS Viewer. With the help of VOS Viewer, a co-occurrence map can be created based on network data, allowing us to understand the flexibility and integrity of collected information. Web of Science, Scopus, Dimensions, Lens, and PubMed are the databases that are taken into account for visualisation.

#### ***4.3 Analysis of Author Co-Authorship Network***

A study was made of the relationships among authors, organizations, and countries. We used VOS Viewer to examine the relationship between authors' works, and how collaborative work provides a new direction and better quality of research papers.

**<Insert Figure 4>**

To analyse this, a minimum number of documents was set; the threshold was at least one research paper co-authored and the number of citations at least four times between 2007 and 2022. This resulted in 25 authors in 9 clusters (Fig. 4) with 26 links between them. Each cluster is represented by a different colour. Goyal N. and Singh S. have the strongest co-authorship network with 3 documents followed by Jain who has a co-authorship network of 2 documents.

**<Insert Figure 5>**

Figure 5 represents the co-authorship network among affiliated countries; the minimum number of documents is set at one. This found that there are 11 countries present which have at least 1 paper; the countries are India, China, Hong Kong, Pakistan, Saudi Arabia, the United States, Ghana, France, Indonesia, Iraq, Norway, Bangladesh and Oman. India has the highest number of documents, 19, with the strongest co-authorship network, followed by China and Pakistan both having 2 documents.

#### ***4.4 Co-Occurrence of Author's Specific Keyword***

Here co-occurrence means the situation occurs at the same time or one thing has a connection with others. In the literature review, we have to understand how the keywords of all the authors are connected, so we can clearly understand the connection. This is essential for further analysis. To analyse more deeply and examine strong bonding between the papers, we have considered author keyword analysis. We used the VOS Viewer of co-occurrence analysis with the help of author keywords. We set a minimum of 3 keywords of occurrences. The result found that out of the 92 keywords, ten keywords met the threshold criteria.

**<Insert Figure 6>**

Figure 6 shows the keywords network that is frequently used by authors in their papers. The result found that the disposition effect had the strongest link and highest occurrence, i.e. 6, with behavioural biases, herding, heuristics, and investment decisions. This modern model can better investigate the topic with regard to behavioural biases and investment decisions.

#### ***4.6 Co-Occurrence Network of Abstract***

<Insert Figure 7>

To analyse more strongly the connection of authors' work, we consider abstract in conceptual structure in biblioshiny for bibliometrix. Figure 7 shows 49 nodes, with these nodes grouped under 3 clusters. **Cluster 1** (red colour) is the largest cluster having 22 nodes. Out of 49 nodes, 22 nodes are grouped. These nodes have a strong connection with each other. This includes biases, investment, research, data, and decision-making etc. **Cluster 2** (blue) is the second-largest cluster with 18 nodes. In this cluster, nodes such as the individual, cognitive, questionnaire, finance, and impact etc. are prominent. **Cluster 3**, in green, contains 9 nodes; this includes findings, implications, model, and influence etc. As there are so many authors, researchers who have adopted the process of systematic literature review to validate new models and hypotheses for this new concept of behavioural finance must establish which theories are different from traditional theories. Our examination shows that much more research work on the modern concept of behavioural biases has been carried out in India recently.

#### ***4.6 Co-citation of cited references***

When two documents are cited together by another one, the frequency of citation is known as co-citation. The high strength of co-citation means that they are more semantically linked. Citing literature motivates the author as it generally occurs when the document contains academically relevant material.

<Insert Figure 8>

For analysis, the citation of reference used the VOS Viewer of co-citation and full counting method. Further, the minimum number of citations set as three, results in the 18 thresholds classified into three clusters. Each cluster is represented by a different colour (Fig. 8). Cluster 1 (in red) consists of highly co-cited references and is the largest cluster. Odean, T., Shefrin, H., Fama, E.F., Nofsinger, J.R. and Sataman, M. have more citations in red cluster 1. Similarly, cluster 2 (in green) includes Ritter, J.R., Glaser, M., Barberis, N., Shiller, R.J. and Prosad, J.M. with the second highest number of citations. Cluster 3 (in blue) has 5 references i.e. Kahneman, D., Benartzi, S. and Baker, H.K.. This co-citation of references has 133 total link strengths.

#### ***4.7 Author Level – Co-Citation Analysis***

Co-citation analysis was also carried out by considering all the authors with the help of VOS Viewer; this gave co-citation of the full counting process. There are 2144 authors present. A minimum number of citations of 10 produced 25 thresholds grouped into three clusters. Cluster 1 (red) includes authors like Kahneman, D. who has the highest number of citations (71) with 1573 link strengths; Odean, T. has 53 citations with 1342 strengths; Tversky, A. has 58 citations with 1287 strengths. Cluster 1 has the strongest bonding. Similarly, cluster 2 (in green) consists of Shleifer, A. who has 17 citations with 429 link strengths and Subrahmanyam, A. who has



14 citations with 416 strengths, Cluster 3 (in blue) includes the author Hair, J.F. who has 10 citations with 196 link strengths. Overall, the three clusters have a total of 300 links and 6886 total link strengths.

<Insert Figure 9>

#### ***4.8 Thematic Map of Authors Abstract***

A thematic map is known as a statistical map. A thematic map describes the dimensional variability of a specific theme including the major information. Here, we used all the abstracts of selected documents and analysed the information by biblioshiny for bibliometrics. Here the thematic map provides four elements: a base map, a network diagram, statistical data, and clusters information.

<Insert Figure 10>

Figure10 shows that there are four clusters present. There are 195 nodes present and these nodes are divided into 4 clusters. **Cluster 1** (red colour) shows the strongest bonding; words like investment, biases, behaviour, decisions etc. have a connection with each other and provide major information. **Cluster 2** (purple) has a connection and information like findings, implications, publishing, practical, methodology approach etc. **Cluster 3** (green) shows words like research, decision making, individuals, analysis, understanding etc. **Cluster 4** (blue) contains factors, trading, future, risk etc.

#### ***4.9 Bibliographic coupling of countries***

Bibliographic coupling occurs when two research work references are common in a third one. When one document cites another document, the strength of other documents also increases. There is a similar strategy in the form of documents, authors, organizations, and countries. To see the connection between countries we used the VOS Viewer of bibliographic coupling of full accounting method. As per Figure 1, this showed that India had 19 documents with 142 citations and 530 link strengths, China had two documents with 215 citations and 413 link strengths while Pakistan had two documents with 5 citations and 250 strengths. Cluster 1 (red colour) includes India, Indonesia, France, Ghana, and Iraq. It has the strongest bonding. Cluster 2 comprises Saudi Arabia, Pakistan, Oman, and China. Cluster 3 has two countries - Hong Kong and the United States. This clustering provides future directions for collaboration and academic research network development.

<Insert Figure 11>

#### ***4.10 Factorial Analysis in the Field of Titles***

We used multiple correspondences and factorial analysis by biblioshiny of bibliometrics to develop the conceptual structural map. The factorial analysis was administered by considering the field of titles of papers. The number of terms is set as 20. Dim. 1 and Dim. 2 showed 40.23 % and 18.85 % correlated variables respectively.

<Insert Figure 12>

Figure 12 shows the word map of factorial analysis. This factorial analysis was also explained with the help of dendrogram parameters (Figure13).

<Insert Figure 13>

## **5. Emerging research theme on biases**

In behavioural finance literature, the consensus view is that influence on investors makes for poor judgment and pricing in the practical field (Barber and Odean, 2001; Fischer and Lehner, 2021). Bounded Rationality theory describes how individuals have limited rationality while making an investment decision; the limitation includes the cognitive capability of the mind to make satisfactory solutions rather than making the best possible solution. When influenced by behavioural bias, people make irrational decisions. Behavioural biases consist of cognitive errors or emotional biases. When reasoning is faulty or errors are present in the memory or information-processing, this defect is known as a cognitive error. Whereas some bias, e.g. emotional bias, is influenced by feelings which are very difficult to change; these include biases such as regret aversion, overconfidence, loss aversion and many more.

### **5.1 Mental Accounting**

Mental accounting is the process of evaluating and differentiating your own money into various mental accounts (Thaler, 2008); this is known as your two-pocket theory. This bias was proposed by Thaler (2008). Chandra (2008), stated that the investment decisions process is influenced by mental accounting bias. Male investors are more influenced by mental accounting than female investors (Lee et al., 2004). Thus, after reviewing the literature, for future research we can make the following propositions:

**Proposition 1:** We need to examine the role of mental accounting in the decision-making process.

**Proposition 2:** We need a strategy development to identify the bias and monitor the investor's decision-making process in investment.

### **5.2 Herding Behaviour**

The behaviour of an investor falls under this category when he is highly influenced by emotions and follows others' decisions rather than making his own independent analysis (Kahneman et al., 2011; Shiller, 2003). Dennis and Strickland (2002) stated that individual investors are more influenced by herding behaviour than institutional investors whereas this case is reversed in the unpredictable market (Lee et al., 2004). With this bias, investors ignore the available information they have and decide by following others (Trueman, 1994). Herding also makes the market inefficient (Kallinterakis et al., 2010). In this case, investors follow the crowd rather than their analysis. Thus, after reviewing the relevant literature, for future research we can make the following propositions:

**Proposition 3:** Influential barriers should be identified to facilitate personal research and strategies in the process of investment decision.

**Proposition 4:** We need to investigate the linkage between herding behavior and investment decision-making, targeting how to control bias and avoid an irrational investment decision.

### **5.3 Representative bias**

Representative bias is bias where an investor thinks that a good company always make good investments and profits. The future is predicted based on the representativeness script (Tversky and Kahneman, 1981). However, it may not be true in all cases. A decision is based mostly on recent events (Ritter, 2003). Sometimes investors suffer from this bias due to referring to a limited number of samples (Grether, 1980; Chen et al., 2007). Investors make the wrong choice since decisions must be made based on something more representative. Representative bias helps in making the decision easier and faster, but it might be the reason for wrong conclusions. For future research, we can make the following propositions:

**Proposition 5:** Proper criteria that measure the bias must be set before making any investment decision.

**Proposition 6:** A computation method must be proposed that helps in an empirical experiment by identifying the representative behaviour to control the bias and provide optimized portfolio selection for better returns.

### **5.4 Availability bias**

Availability bias is the bias that persuades investors to have more trust in personal trends and assume them to be the market reality. It is an information processing error that depends on the experiences which are readily available rather than verifying the actual scenario of the market. Sometimes the decision-making process is affected by some irrelevant information (Harris and Raviv, 2005). There is a significant positive relationship between availability bias and decision making as noted by many researchers (Rasheed et al., 2018; Waweru et al., 2008; Javed et al., 2017). The study by Rehan and Umer (2017) stated that bias negatively impacts decision-making. Thus, after reviewing the literature, for future research we can make the following propositions:

**Proposition 7:** We need to explore and analyse the role of this bias and how it affects the investment decision.

**Proposition 8:** We need to devise a strategy to measure the actual conditions and reality of the market before making an investment decision, ignoring any irrelevant information without verification.

### **5.5 Emotional Bias**

Emotional bias is the kind of impulse or intuition that is based on feelings that are very difficult to change. This emotional bias includes loss aversion, regret aversion, and overconfidence etc.

### **5.5.1. Overconfidence bias**

Overconfidence is a situation in which people are highly optimistic about the outcome result. When the market performance is high, investors think this is due to their performance (Zahera and Bansal, 2018). This bias makes investors less cautious about their investment. Due to the illusion of control and illusion of knowledge, mistakes are made by investors. Barber and Odean (2001) found that males are more confident than females. To make a perfect investment decision, investors require skills, intellect, or talent. Investors may have a false and misleading notion of their abilities, believing that their ability, skills, and intellect are higher than they actually are (Budiarto and Susanti, 2017; Barber and Odean, 2001). People can find this bias in others but most fail to identify it in themselves. Based on the above arguments, we can propose the following:

**Proposition 9:** We propose a strategy through which an investor can think of the consequences, reflect on personal limitations, and give attention to feedback before any kind of investment is made.

**Proposition 10:** We need to examine the role of overconfidence in investment decisions.

### **5.5.2 Loss Aversion**

This occurs when an investor feels greater pain for losses rather than feeling happiness for the same amount of profit gain. The bias of loss aversion causes the downside impact of loss to be greater than the upside impact of gain. Kahneman et al. (1991) found that loss aversion bias influences investors into making an irrational investment decision. Female investors have more loss aversion bias than male investors (Hassan et al., 2014; Blavatsky and Pogrebna, 2008). There is a significant positive relationship between loss aversion bias and investment decision. (Lather et al., 2020; Lim, 2012; Zat and Khan, 2017). Thus, we can make the following propositions:

**Proposition 11:** We need to examine the role of loss aversion and its effect on the decision-making process.

**Proposition 12:** We must prepare an innovation portfolio approach, appropriate frameworks and methods in the investment project.

### **5.5.3 Regret Aversion**

This happens when an investor refuses to make any kind of decision due to fear of a negative outcome; this leads to feelings of regret. This regret is the reason for the emotional pain that affects future decisions of the investor. Regret aversion bias has been researched in many papers (Loomes and Sugden, 1982; Bell, 1982). According to Muermann and Wise (2011), those investors with regret aversion bias usually invest their funds according to set plans. Many researchers (Kengatharan and Kengatharan, 2014; Lim, 2012; Zat and Khan, 2017; Jain et al., 2020) found that regret aversion can impact positively on the investment decision-making process. For future research, we can propose:

**Proposition 13:** Before investing, we must prepare a diversified portfolio approach and strategy to avoid bias.

**Proposition 14:** We need to analyse the role of this bias and its effect on investment decisions by procuring the help of unbiased analytics and financial planners.

## 5.4 Research Gap

After performing a comprehensive review of the literature from 2007 to 2021 on behavioural biases and investment decisions, we have found that there has been ongoing progress in the body of literature. Research gaps identified for future research include:

- There is a requirement for more advanced statistical techniques which can identify the biases present in investors and provide the most suitable and optimized solutions.
- Behavioural bias is a modern concept that is different from traditional concepts. Nowadays it's essential to understand all biases before making any kind of investment. There is no specific organization or procedure available to make investors aware of the impact of biases. Theory-based quantitative research needs to be thoroughly addressed in future research.
- The quantity of research on different biases like emotional bias, status quo, representative bias etc. is lacking. So, more work is needed in this area to observe these biases and their consequences.

## 6. Discussions

A systematic literature review and bibliometric analysis were conducted. This allowed us to analyse the research trends in behavioural biases and investment decisions and to segregate documents into different clusters to observe their themes and the association between them; this identified gaps for further research. For bibliometric analysis, VOSviewer, and bibliometrics software were employed. To address the first objective, relevant literature published between 2007 to 2022 was reviewed to gain a thorough understanding of the characteristics of identified behavioural biases and their impact on decision making. We considered 27 articles for analysis. SLR was conducted in an effort to understand how existing research work is connected and to provide valuable information for future study. It was observed that research work on behavioural biases and investment decisions around 2007 was very limited as it was a relatively new concept then. However, after 2009, research has steadily demonstrated an upward swing. India has the highest number of documents under study i.e. 19, with the strongest co-authorship network. This is followed by China and Pakistan with 2 documents. The most influential journal is Journal of Behavioural Decision Making with authors Chen et al. (2007) having the highest number of citations - 215. We set up the network map with the help of co-authorship, co-occurrence, thematic map through VOS Viewer, and biblioshiny of bibliometrix. This creates interesting patterns and themes of behavioural biases and investment decision-making and provides the intellectual structure of this study through clusters. This was accomplished by forming a thematic map by biblioshiny of bibliometrics. The thematic map considered the abstracts of all the authors and observed the dimensional variability present in the research study. Finally, a demonstration was made with four clusters with different colours showing how their abstract information bonded with each other. The SLR (Systematic Literature Review) helps in understanding the role and effect of cognitive and emotional biases on investment decisions. The cognitive error generated from memory includes biases like mental accounting, herding behaviour, representativeness, and availability bias. Biases based on feelings known as emotional bias include overconfidence, loss aversion, and regret aversion. From the review and information gathered, the study found that investors are influenced by these biases resulting in irrational investment decisions being made.

## **6.1 Implication**

Behavioural biases play a vital role in the cognitive thinking process of investors. This creates a perceptual map of biases in the minds of investors, influencing irrational decisions. Findings from the study reveal both academic implications and business implications. For academic purposes, behavioural bias provides key insights of biases affecting all investors, suggesting how outcomes will be shaped. The study also identifies the progress made over the years from traditional concepts to modern concepts. It is recommended that financial plans of individual investors should include a proper strategy to ensure a quality investment. The study suggests that institutional investors or financial brokers should create a strategic retention program, building a portfolio by considering the impact of biases and all risk factors. This will guarantee that the decision for investment will be rational and returns from the portfolio will be optimum. Governments can make a societal contribution by running various programs of 'investor awareness' to increase the knowledge base regarding biases, financial markets, and important practical insights into this concept.

## **7. Conclusion**

The main contribution of this article is to give an insight into the themes and associations present in the subject of behavioural biases and investment decisions by analysing those highly cited research documents published by top contributing authors from top journals and a range of countries. To achieve this, the study has conducted a review of the literature from Scopus indexed journal publications that investigate behavioural biases and investment decision-making to identify the existing gaps and provide optimized solutions. From these observations, we have found that most of the research has been contributed by authors from India, China, Pakistan and U.S as per the country-wise scientific production analysis. The analysis conducted in this area, with the help of various frameworks like VOS Viewer and biblioshiny of bibliometrix, gives an overview of the researched topics and identifies the proposed dimensions. Under bibliometric analysis, we have identified the trends in this area, classifying the topmost authors' publications with their citations, journals, countries, and bibliographic coupling by clustering these documents. The dimensions cover most related articles on behavioural biases and investment decisions. These findings will help decision-makers to create a framework that helps individuals to identify their biases and make rational investment decisions. The proposition of biases includes the emerging research themes of biases that give direction for future study. With the help of this study, some propositions are made by analysing the biases for future study and developing the best framework and strategy for rational investment. Moreover, future researchers can explore the areas identified and give more effort and understanding to creating models or tools to identify the characteristics of biases. This will provide a feasible solution to every kind of investor - individual investors, institutional investors, financial advisors and experts - to avoid irrational decisions by mitigating the biases.

## **8. Limitations and Scope of future work**

This study has some limitations. It has considered only Scopus database journal publications, excluding conference publications, editorials, and book chapters. For reviewing and analysing the literature, only the tools of VOS viewer and bibliometrics were used. Through these tools,

we get to know the connection between authors, documents, organizations, and countries; this reveals the relationships between authors' works, and how collaborative working provides a new direction and better quality of research papers. Further, the study can be extended by practitioners as well as academicians to explore how behavioural biases impact investment decisions. Future research could also expand this study by considering other databases like Web of Science (WOS) and IEEE Explore. We can extend this study to different types of tools like Cite space, Bib excel, Histocyte, and Gephi, etc., rather than VOS viewer and bibliometrics; this may give better understanding and review. More study is required on a global basis. Cross-cultural considerations can better understand behavioural biases like recency, house money effect, self-attribution and status quo, all biases that affect investors. Advancing the present models will provide optimized solutions for investors. Future research can progress in the direction of stock markets and investors who are more inclined towards investment in the stock market aligned to the derivatives market. Work can be extended to empirical research based on primary data in analysing the biases impacting investors' decision-making. Further, along with cognitive and emotional biases, other biases should be taken into consideration. A comparative analysis can be carried out among institutional and retail investors with the moderating and mediating effect of demographic variables impacting the biases in the investment decision-making process.

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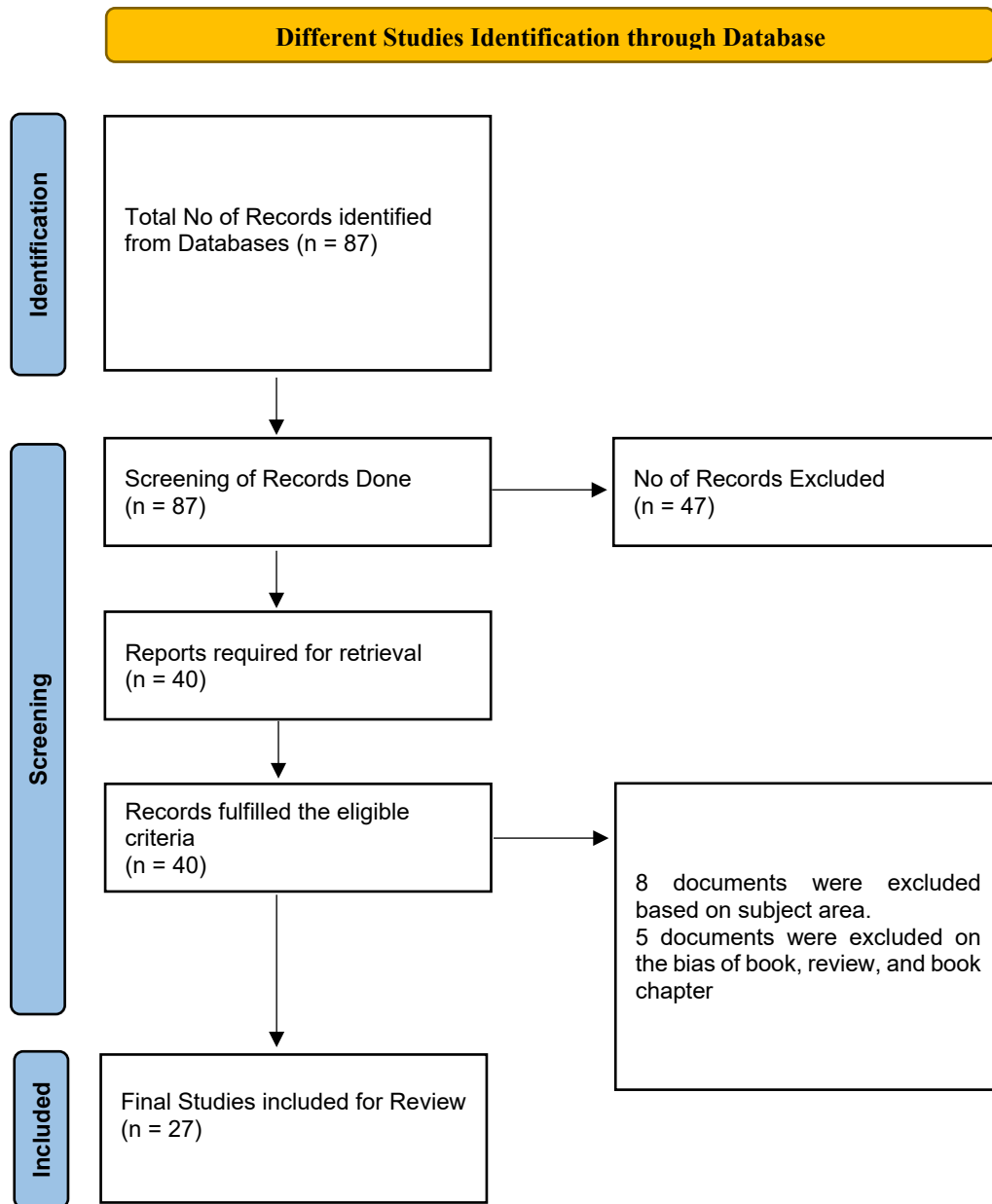


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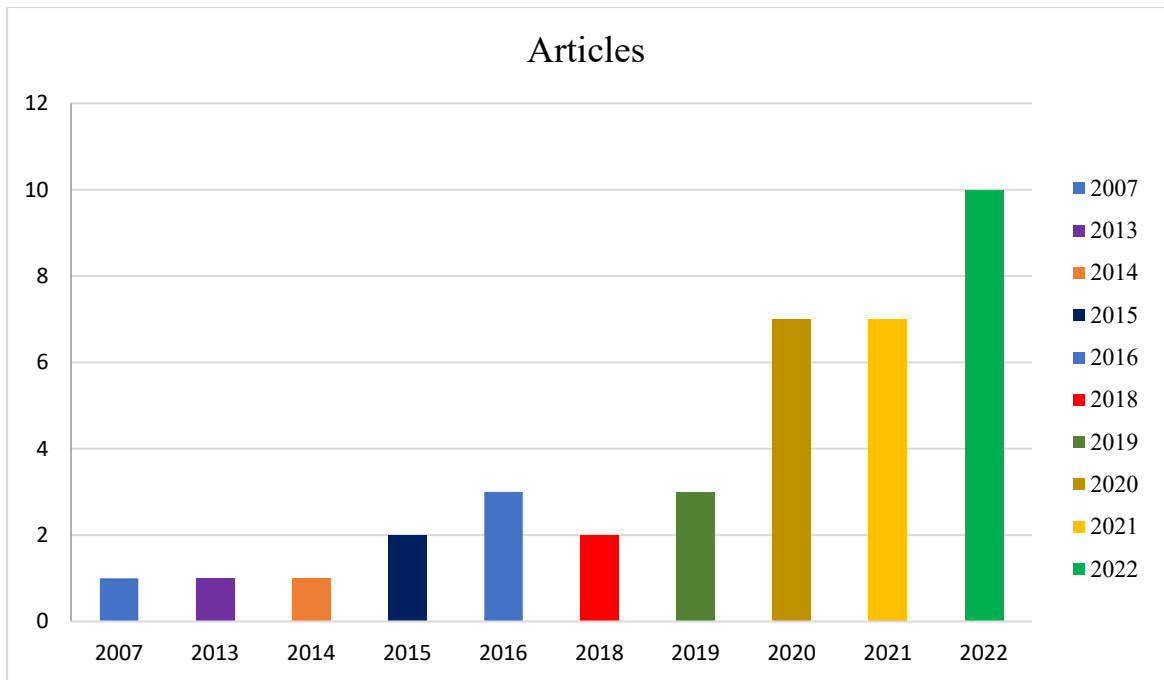
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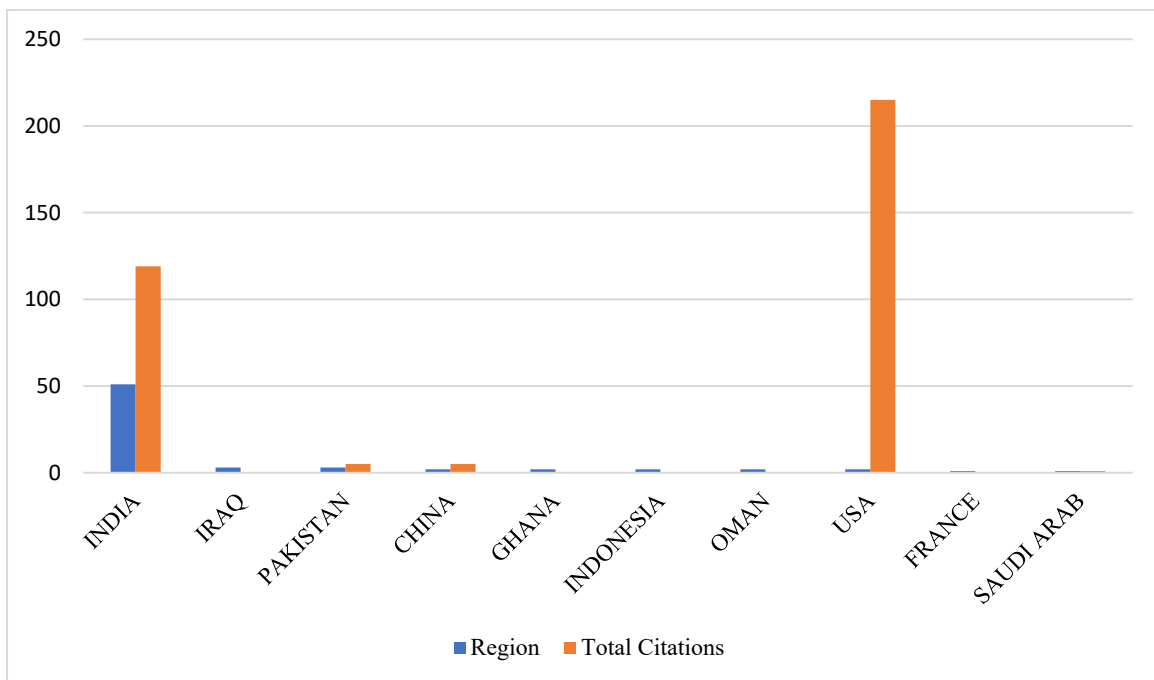
## Figures



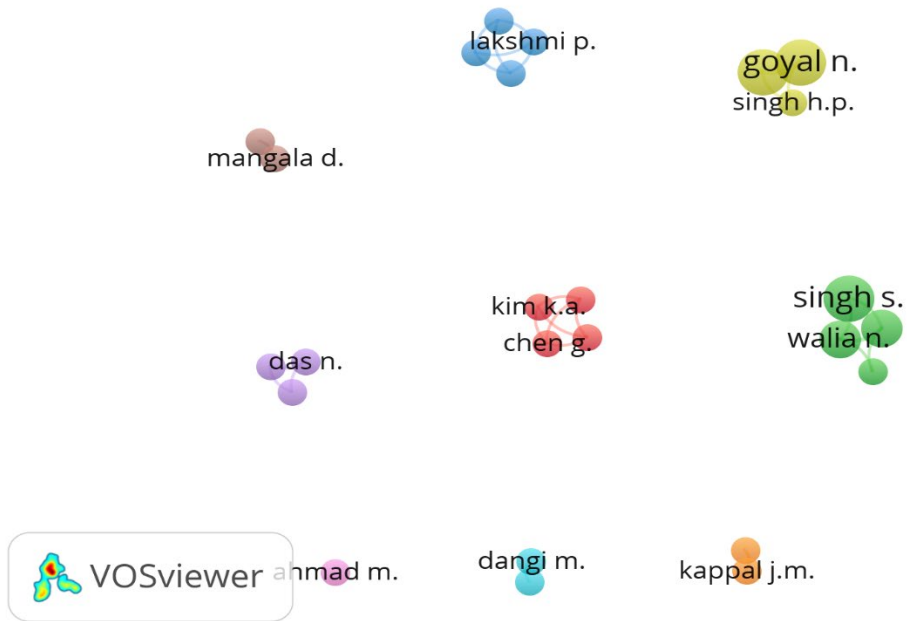
**Figure 1:** Flow Diagram (PRISMA)



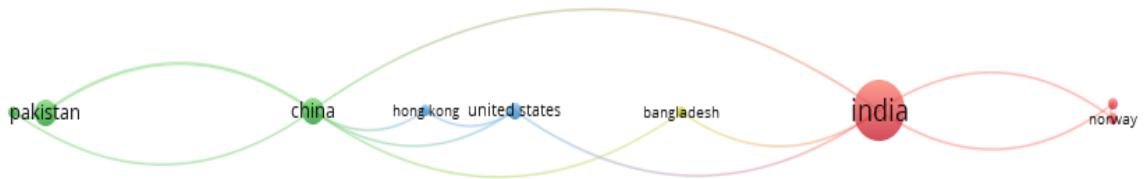
**Figure 2: Article publication per year**



**Figure 3: Country wise scientific production and citations**

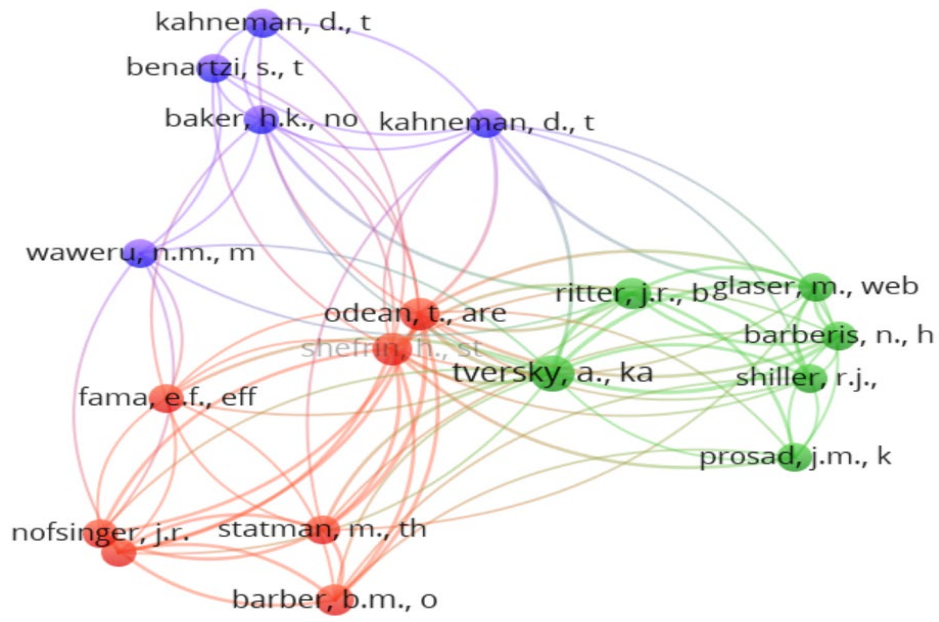


**Figure 4: Co-authorship network**

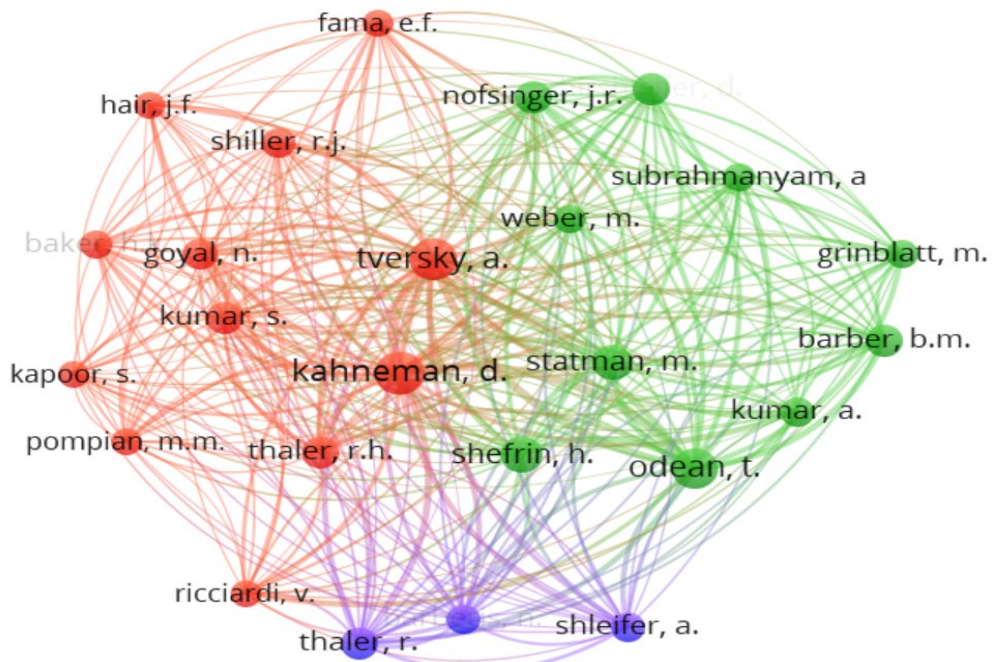


**Figure 5: Co-Authorship Network among affiliated Countries**



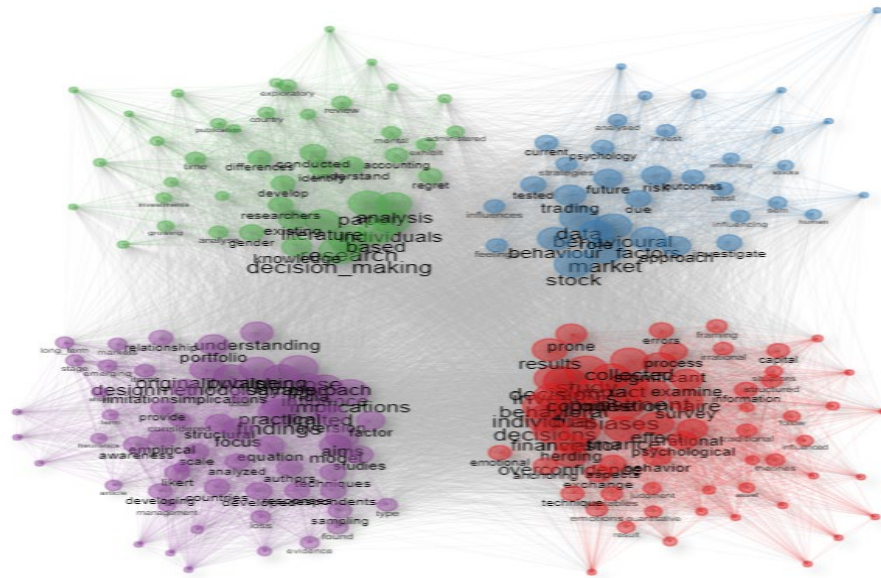


**Figure 8:** Co-citation map

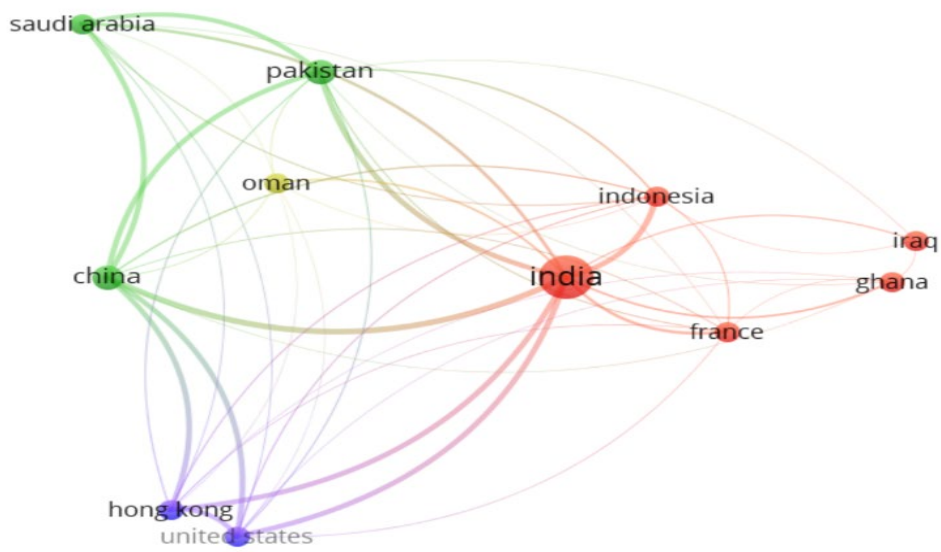


**Figure 9:** Co-citation analysis at the author level





**Figure 10:** Thematic map of authors abstracts



**Figure 11:** Coupling of countries

### Conceptual Structure Map - method: MCA

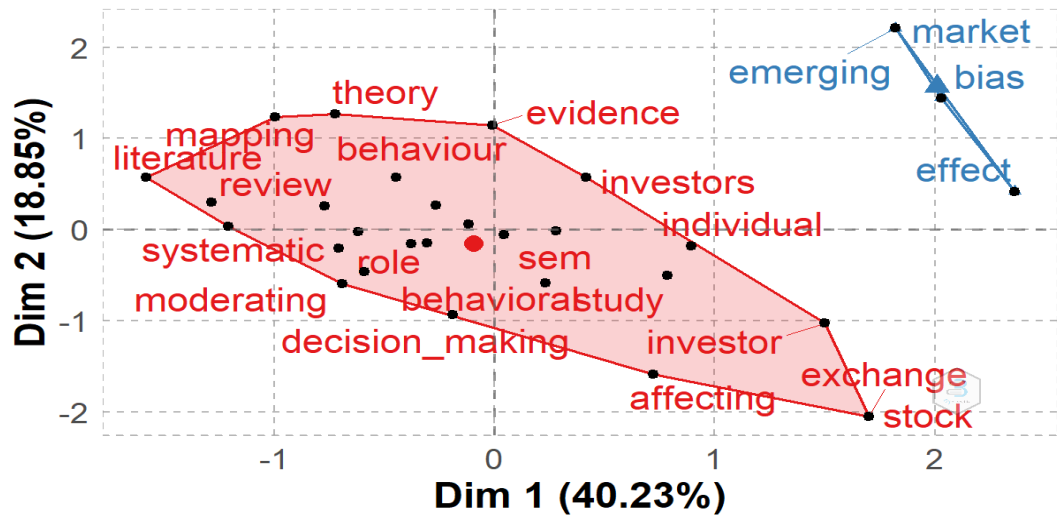


Figure 12: Conceptual structural map

### Topic Dendrogram

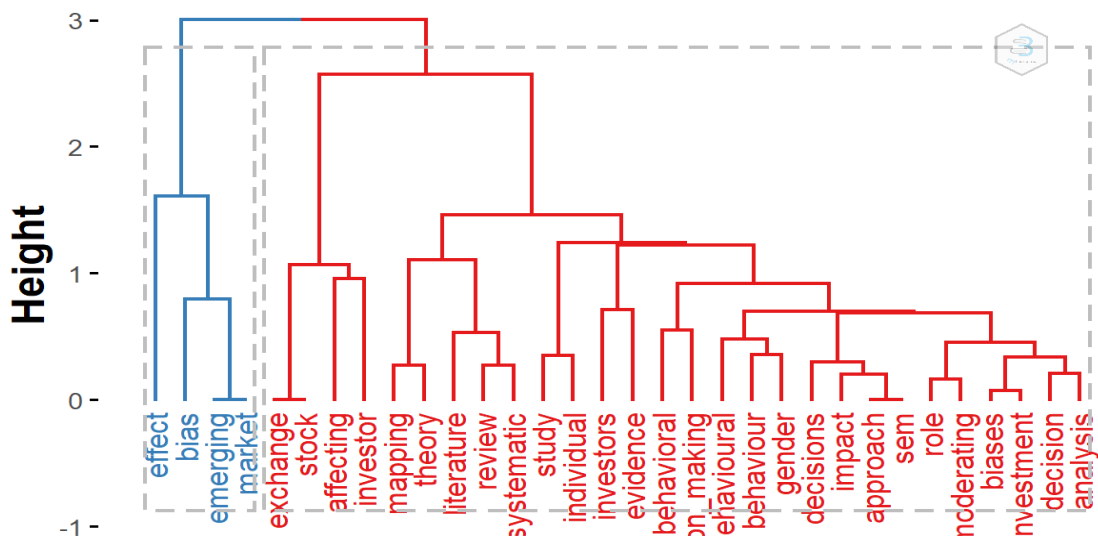


Figure 13: Topic dendrogram

## Tables

**Table 1:** Criteria for Inclusion/Exclusion of Papers

Inclusion Criteria	Exclusion Criteria
Article Published in Scopus Indexed	Book Chapters, Conference papers, Conference Review, Articles outside the scope of Behavioural Finance
English language	
Both Global and Local documents	

**Table 2:** Descriptive data regarding Scientific Papers Retrieved from SCOPUS Database

Parameter	Outcome
Period	2007-2022
Sources (Journals)	20
Documents	27
Avg Years from Publication	2.78
Avg Citations/Document	13.44
Avg Citations per Year per doc	1.764
Keywords	12
Author Keywords	92
Authors	63
Documents per Author	0.429
Collaboration Index	2.5

**Table 3:** Highly cited research papers in the field of Behavioural Biases and Investment Decision Making (2007–2022)

Authors	Journal Title	Research article Title	Country	Citations	h-index
Chen et al., (2007)	Journal of Behavioural Decision Making	Trading Performance, Disposition Effect, Overconfidence, Representativeness Bias, And Experience of Emerging Market Investors	USA	215	1
Kumar and Goyal (2015)	Qualitative Research in Financial Markets	Behavioural Biases in Investment Decision Making – A Systematic Literature Review	India	62	3
Kumar and Goyal (2016)	Qualitative Research in Financial Markets	Evidence on Rationality and Behavioural Biases in Investment Decision Making	India	24	1
Lakshmi et al.,	International Journal of	Assessing the Linkage of Behavioural Traits and	India	8	1

(2013)	Economics and Management	Investment Decisions Using Sem Approach			
Mangala and Sharma (2014)	Indian Journal of Finance	A Brief Mapping of Theory and Evidence of Investors' Behavioural Biases	India	7	1
Dangi and Kohli (2018)	Indian Journal of Finance	Role of Behavioural Biases in Investment Decisions: A Factor Analysis	India	6	1
Singh, Goyal and Kumar, (2016)	Indian Journal of Finance	Behavioural Biases in Investment Decisions: an Exploration of the Role Of Gender	India	6	3
Zhou and Yang, (2020)	Empirical Economics	Investor sentiment, investor crowded-trade behaviour, and limited arbitrage in the cross section of stock returns	China	5	1
Ahmad, (2020)	Management Decision	Does Under confidence Matter in Short-Term and Long-Term Investment Decisions? Evidence From an Emerging Market	Pakistan	5	1
Kappal and Rastogi (2020)	Qualitative Research in Financial Markets	Investment Behaviour of Women Entrepreneurs	India	4	1
Raut, Das and Kumar, (2018)	Asian Journal of Business and Accounting	Extending the Theory of Planned Behaviour: Impact of Past Behavioural Biases on the Investment Decision of Indian Investors	India	4	1
Madaan and Singh (2019)	International Journal of Financial Research	An Analysis of Behavioural Biases in Investment Decision-Making	India	3	1
Khawaja and Alharbi, (2021)	International Journal of Social Economics	Factors influencing investor behaviour: an empirical study of Saudi Stock Market	Saudi Arab	1	1
Jain et al., (2021)	Management Review Quarterly	Mapping the Field of Behavioural Biases: A Literature Review Using Bibliometric Analysis	India	1	2
Lather, Jain and Anand, (2020)	International Journal of Management	An Empirical Examination of the Impact of Locus of Control on Investor Behavioural Biases	India	1	1
Jamil and Khan, (2016)	International Journal of Economics and	Does Gender Difference Impact Investment Decisions? Evidence From Oman	Oman	1	1

	Financial Issues				
Compen et al., 2022	Decision Support Systems	How to elicit and cease herding behaviour? On the effectiveness of a warning message as a debiasing decision support system	Belgium	3	5
Liu et al., 2022	Journal of Financial Economics	Taming the bias zoo	Hong Kong	31	5