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A Prisma Review of Loss Aversion, Overconfidence, Herd, Confirmation, Anchoring, Availability, Mental and Regret Bias on Investors Decision Making: A Vos-Viewer Analysis

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Abstract:

Purpose: *This study aims to present an all-inclusive knowledge mapping and depth analysis of behavioral bias effects on investment decisions to recognize the global trends and flows in this field that appeared in between JAN 2002 to APR2024.*

Design/Methodology/Approach: *This study analyzed 55 documents listed in the International Scopus Database related to Behavioral Biases and Investment Decision-Making. The knowledge mapping by utilizing VOSviewer shows the analyzed results, which come from Co-occurrence analysis, Co-citation analysis, Citation Analysis, Keyword analysis, and Bibliometric Coupling analysis.*

Findings: *The analysis found that (i)Overconfidence Bias and Herding Bias are the two topmost studied biases among the researchers, (ii)Before screening the article, USA and UK found out as the top countries contributed in the field, however after screening process, Pakistan and India identified as the top countries that contributed heavily in this field. (iii) the upward trend was noticed after 2015-16 in this field of study through overlay visualization. (iv) Kahneman David, Tversky Amos, and Odean Terrence are the most renounced authors found. (v)Nine out of Ten most renounced authors come from the USA. Not surprisingly, behavioral Bias is a crucial topic in investment decision-making and cannot be denied. However, Loss aversion Bias, Mentality Bias, Regret Bias, and Anchoring Bias require more attention in future research.*

Originality/Value: *the present work is unique in its way of contribution, and to the best of the researchers' knowledge this study will be as a guide to the future study of behavioral biases effect in investment decision-making subjective field.*

Introduction

The effectiveness and shrewdness of investment decisions are regularly affected by various behavioral preconceptions. Conventional finance theory puts forward that Investors over and over again make logical selections grounded in thorough sentiments, partialities, and mental restrictions(Almansour & Arabyat, 2017).These non-financial factors play a key role for investors having an effect on investment decisions especially those related to stocks. Scientists have pinned down numerous behavioral finance foundations that can impact investment choices, encompassing biases, risk perception, societal pressure, and individual characteristics(Lather et al., 2020).Recent research indicated that both real experiences and scheduled emotions significantly affect our decisions(Y. Chen & Ma, 2009; Fong & Wyer, 2003).Another key factor in investment decisions is the dissimilar range of investors. Those who laboriously trade or indulge in this activity, oftentimes overrate their abilities, resources, and the information they possess. Their optimism towards overconfidence biases plays their part here and leads them to hold too few shares when the market is in the bullish cord, this behavior pitches into market inefficacious by causing mispricing and redundant volatility(Abreu, 2019).In observing personalized investment behavior, comes across the result that contradicts conventional finance theory, successfully negotiated that often investor while constructing investment decision does not act normally, highlighting deviation from usual rational behavior.(Katper et al., 2019) quoted that investment decision-making can be influenced by the psychological factors of an investor.

The dimension of behavior finance articulated that the complex interplay of personality traits always plays a significant role in an investor's decision-making. Personality traits that were recently stated by several researchers that display their undeniable influence during the decision-making process are Overconfidence Bias (preferences to oversize their understanding and experience) (Dittrich et al., 2005; Graves & Ringuest, 2018; Parveen et al., 2020), Anchoring (preferences the first favor information expected in the decision-making process)(Jain et al., 2023; Shah et al., 2018; Sudirman et al., 2023) {tendency to estimate the future returns, which are an unknown value, then they usually begin with some benchmark), availability bias (tendency to be influenced by the information that comes faster in the mind during decision making)(Shantha & Vedantam, 2019; Srinivasan & Karthikeyan, 2023; Sudirman et al., 2023), herding bias (preferences to trail the crowd)(Almansour et al., 2023; Paul & Sundaram, 2023; Sabir et al., 2019), confirmation bias (tendency to acknowledge a new set of facts as confirmation of preexisting beliefs)(Bihari et al., 2023; Hasan et al., 2023; Mohanty et al., 2023; Nickerson, 1998), mental bias MENTAL BIAS LIKHNA HAI(tendency to indicate), Regret Bias (tendency to anticipate the regret after composing the decision) (Hala et al., 2020; Malik et al., 2021; Rasool & Ullah, 2020).

The developing market, more precisely the emerging financial market shows great relevance to this research as the Behavioral finance bias plays a momentous role in the purchase and sell decision of stocks and the positive and negative income of an investor. Investor decisions can be influenced by how choices are organized. A rational investor might eliminate the chances if itis demonstrated with potential gains despite the risks, but might accept the same chance if it is enclosed around the improbability of potential losses. Mean-variance optimization gives rise to a conventional investment approach, aiming for the same optimal risky portfolio while disregarding behavioral biases. Rational investors often have a shortage of identical information sets and they process differently if they do have identical information(Toma, 2015; Ullah et al., 2020). Having access to information is crucial for fashioning rational decision making. Investors with restricted material or lack of information make the unfortunate decision of being more helpless to problems. Investors regularly encounter vagueness due to the quality and magnitude of attainable information(Fernández et al., 2011).

This article presently aims to find the pre-existing literature gap by thoroughly looking over the publications on behavioral bias in the environment of investment decision-making. The primary focus of this SLR is to propose an inclusive impression of the present behavioral research and find the main theoretical and experimental works that expressively participate in the progression of this emergent field. We follow these research questions in this review:

RQ1. On which behavioral bias has received the latest attention in recent academic work?

RQ2. Which subject area has produced the highest no of behavioral bias studies?

RQ3. Who is the most productive originator in this field?

RQ4. Which article has garnered the highest impact based on the number of citations?

Literature Review

- **Loss Aversion**

Previously, researchers pointed out that Loss aversion, in terms of rational decision-making, could be one of the main influencing factors that arise(Meka & Tosku, 2023).Loss aversion is a behavioral bias that depicts the circle for investors to desire to escape losses rather than obtain equivalent profits. Investors experience heightened feelings such as happiness, enthusiasm, and nervousness during the gains and losses(Srinivasan & Karthikeyan, 2023).This biascan trigger investors to control investments for a long time, expecting to improve their investment profitable option. People have a tendency to overestimate the negative outcomes and are enthusiastic to take excessive risks to avoid them (Meka & Tosku, 2023). This can create consequences for several sub standard behaviors, for instance, failing to sell underachieving assets, avoiding required risks due to anxiety of loss, and accepting an overly conservative investment strategy that might return less.

- **Overconfidence**

Overconfidence bias in decisions related to investment, frequently causes investors to overemphasize their capacity to pick winning stocks or foresee market tendencies, ensuring excessive trading and less diversification. In a competent market, investment judgments are influenced by over confidence, which is demonstrated in the misinterpretation of investment opportunities(Malmendier & Tate, 2004).An optimistic risk perception is put on display by overconfident investors, making them additionally motivated to adopt a risky position when investment judgments are made(Parveen et al., 2020).De Bondt and Thaler's significant analysis in 1985 claims that investors habitually overreact to astonished news. Further, It was observed by (Daniel et al., 1998; Paul & Sundaram, 2023) that investor reaction can be influenced by the public and private nature of the influence, which hints them to be overconfident.

Investors demonstrate overconfidence, which directly influences their financial behavior(Ngoc, 2013), depending on the marketer's condition in both positive(Qadri & Shabbir, 2014; Salehi et al., 2023) and negative ways(Mohanty et al., 2023; Putri et al., 2020).Despite this, it was detected that the elasticity of being influenced by overconfidence bias is generally low for high-net-worth individuals (HNWIs) and their investment decision making ability (Parhi & Pal, 2022). The specific pattern has been termed that early gains and a particular set of skills are often heavily relied upon by investors, encouraging an exaggeration of their wisdom while risks are understated(Barber & Odean, 2000).While claiming the enhancement of market capabilities, as new and versatile information brought by the overconfident investor for a greater level of the rationality of the market, as the odds of mispricing is minor(Ko & Huang, 2007).On the contrary, returns show negative trends to the investors after being influenced by overconfidence bias.

- **Herd Bias**

Herd Bias in Investment evaluationis a cognitive bias where the pattern of followingof an individual sticks to the action or principles of a larger group(Blasco et al., 2012; Paul & Sundaram, 2023; Quang et al., 2023; Sharma & Firoz, 2020; Spyrou, 2013; Srinivasan & Karthikeyan, 2023).It is an imitative behavior by one investor of the same level as other investors, that can bring a significant impression on his selection pattern of stock or investment policies(Almansour et al., 2023; Bikhchandani & Sharma, 2001). Around the global market(T. Chen, 2013), herding biasinfluences the stock price movement, of its strong manipulative behavior of affecting risk and return model, which further leavesa mark on the scale of assets pricing theories(Quang et al., 2023).The pattern of mimicking the following investor is sometimes found that much stronger in that despite being rational or having their own reliable source of information, investors do go with the flow of the bigger group(Blasco et al., 2012).

- **Confirmation Bias**

In the process of investment decision-making, Confirmation Bias triggers the investors to look for and focus on information that goes with the pre-established beliefs or investment judgments, at the same time denying and terminating evidence that undermines them. Simply if the information is suitable to your thought then accept it otherwise reject it (Hasan et al., 2023).Accepting and emboldening their own thoughts and beliefs often centrals them to be overconfident in financial decisions, unsatisfactory expansion of assets, and bringing a pattern to hold the losing investment for so long period while trading the winning investments early. Researchers identified confirmation bias as the most regular(Berthet,

2022; Mohanty et al., 2023) and selective exposure(Hasan et al., 2023)bias among practitioners. The most recent pattern that can be observed of confirmation bias is in the case of cryptocurrency. Investors are commonly trapped in the belief of enormous returns and projection of future upward trends in values, at the same time ignoring and softening risks, warnings, and examples of sensational losses.

- **Anchoring Bias**

Anchoring bias, also known as adjustment bias occurs when an investor puts his faith too much toward the opening set of information such as the stock price prediction, market trends, or one-day returns, and dodges recent information(Iram et al., 2023; Wilczek, 2016), which proves itself to be an anchoring factor for an investor's succeeding decisions(Shah et al., 2018; Srinivasan & Karthikeyan, 2023).It is the bias of a lone investor to "anchor" his old thoughts and ideas to a rational unnecessary reference point in the decision-making process. Previous research claims the existence of anchoring bias more on females rather than men in general during the entrepreneurial movement(Matsumoto et al., 2013; Qasim et al., 2018).The overreliance characteristics of anchoring bias easily distort investors' perception of an investment's real cost and pave the way for suboptimal decision-making.

- **Availability Bias**

When an investor particularly has confidence in the readily reachable information, or some happening events, or forecasting instead of relevant and reliable data, then this cognitive heuristic bias is considered, as an availability bias(Ngoc, 2013; Shah et al., 2018).This gives the expected overreaction of an investor due to their vagueness in refining the information at the point of a reliant situation as their strong belief in the prediction is based on available information. Being unable to scrutinize and log into pertinent facts, figures, and the existence of information because of a lack of thoughtful reasoning is the key identifier to availability heuristic bias. This directly affects the investors as well as the professional practitioners(Shantha & Vedantam, 2019). In the context of investment decisions, some researchers found a significant positive impact of availability bias on their investment decision-making, whereas some of them were seen as a factor that caused their downfall in the investment decision(Massa & Simonov, 2005; Waweru et al., 2008).

- **Mental Bias**

The term Mental Bias substantially has an effect on decision-making, that often leads to illogical and disastrous financial outcomes. Mental accounting bias is a certain kind of mental bias that brings impacts on various investment-related decisions. It treats the investment of the investors in a different way suitable according to the purpose or categories such as funds for education, or funds for retirement. It is a pattern for designing individual accounts for different investments chosen for invest according to investors' positions(Sharma & Firoz, 2020; Thaler, 1999).This bias is known for misguiding investors about their complete portfolio health by concentrating on alone investors account.

- **Regret Bias**

Regret bias is a guilty feeling that is realized after an individual investors attempt any crucial decision and find themselves wrong(Fogel & Berry, 2010; Rasool & Ullah, 2020).This bias is known for its excessive vigilance and hard-hitting behavior. This can be understood by this example that influenced investors who sold any particular share too early the first time and failed to spot any significant profit will surely hold different groups of shares for too long, and be afraid of having the regret bias the second time. The pattern of experiencing discomfort when their chosen investments underachieve and feel embarrassed about their bad decisions(Srinivasan & Karthikeyan, 2023).It was also seen that investors when delayed in decision-making in contingent situations often experience regret. Further, regret-averse people generally avoid the distress that comes from mistakes such as errors of commission and errors of omission (Malik et al., 2021).

Methodology

- **Database**

SCOPUS database is the most reliable, consistent, all-inclusive, and citation-based database of peer-reviewed literature, which contains nearly 29000 journals database is considered a principal source of Systematic Literature Review, and has been used previously in numerous studies (Al Faruq et al., 2023; Che Hassan et al., 2023; Yan et al., 2023).

- **Identification**

It is a process of finding suitable synonyms, and related terms and adopting basic keywords from the previous study, which are Behavioral Bias, Investment, and Decision-Making. These keywords provide the dimension for searching other pertinent literature for the systematic review. The Preferred Reporting Items for the Systematic Review and Meta-analysis (PRISMA) method were applied to support the Systematic Literature Review(SLR), following this, analysis was preferred and the conclusions were staged descriptively.

- **PRISMA Model and Inclusion and Exclusion Norms for Selection of Literature**

The PRISMA model is a uniform framework that is used to design reporting and guide the systematic literature review. The prime objective is to make certain that researchers follow a systematic process when reviewing and synthesizing previously available literature for consistency and reproducibility of their findings. Identification, Screening, Eligibility, and Inclusion are the only four phases followed under the PRISMA Flow Diagram(Kumar et al., 2023; Sathurshan et al., 2022; Yan et al., 2023). The first phase is the identification pile-up a record of potentially pertinent studies from a mixture of databases and other databases. Defining the relevance of the literature according to titles and abstracts involved in the screening phase. In the eligibility phase, full-text articles are assessed against predefined criteria to match their effectiveness for adding to the final review. The final phase is the inclusion phase, in selecting the literature that justifies the norms that are included in the review process systematically. We attempt to explore the information of publications about various Behavioral Biases within a day to avoid any new updates in the database. A simple text format is used while collecting the information regarding titles, indexed keywords, abstracts, authors, institutions, and references saved from the paper.

The Indexed keywords are upgraded according to SCOPUS before coming into a search string corresponding to the Boolean Operators, Phrase Finding, Truncation, and Wildcard).

Table 1. Database, Search Strings, and Outcomes

SCOPUS	(TITLE-ABS-KEY ("Loss Aversion" OR "Overconfidence" OR "Behaviour* Bias" OR "Mentality" OR "Confirmation" OR "Anchor*" OR "Availability" OR "Regret" OR "Herd*") AND TITLE-ABS-KEY ("Invest*") AND TITLE-ABS-KEY ("Decision Making")) AND PUBYEAR> 2002 AND PUBYEAR< 2024 AND (LIMIT-TO (OA , "all")) AND (LIMIT-TO (LANGUAGE , "English"))	2516 Results (before applying the filters mentioned in Table 2.)
SCOPUS	**(TITLE-ABS-KEY ("Loss Aversion" OR "Overconfidence" OR "Behaviour* Bias" OR "Mentality" OR "Confirmation" OR "Anchor*" OR "Availability" OR "Regret" OR "Herd*") AND TITLE-ABS-KEY ("Invest*") AND TITLE-ABS-KEY ("Decision Making")) AND PUBYEAR> 2002 AND PUBYEAR< 2024 AND (LIMIT-TO (OA , "all")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "ECON"))**	**626 Results (after applying the criteria mentioned in Table 2.)**

Note: Wildcard is used to recovervariations of spellings.

Eight distinctive filters were identified and applied for the selection of required articles,on the basis of previous studies(Al Faruq et al., 2023; Tantowi et al., 2023)

Table 2: Eight Filters for the Selection of Required Articles

Indexation	SCOPUS Indexed
Year	2002-2024
Language	English
	Peer Reviewed
Access	All Open Access
Subject area	Limited to Social Science, Business, Management and Accounting & Economics, Econometrics and Finance
Availability	Literature available in Full PDF file.
Focus	On Various Behavioral Bias and Investment Decision Making

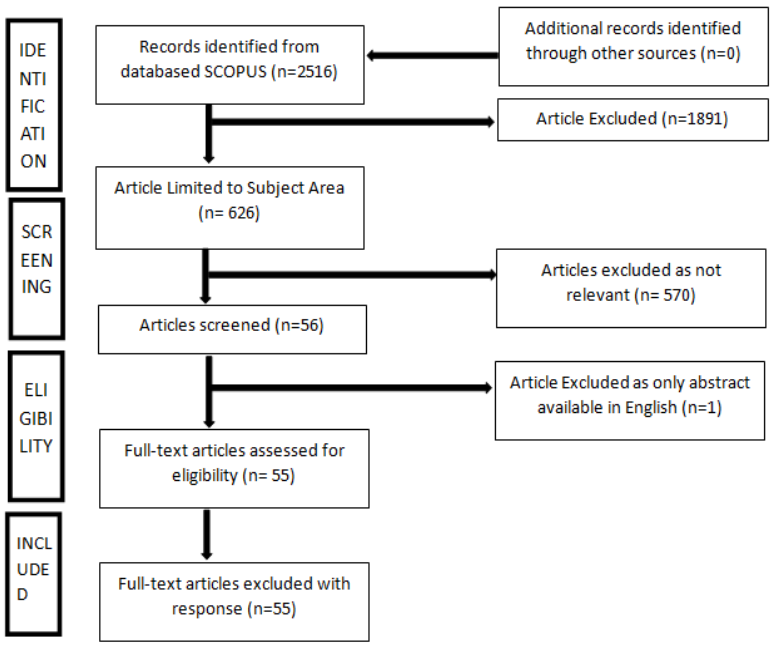

Figure 1: PRISMA Flow Diagram for Systematic Literature Review

In the first stage of the PRISMA Model, a total of 2516 Scops index articles were found. During the Screening stage, these articles were filtered by subject area which is Social Science, Business Management and Accounting &Economics, Econometrics, and Finance, resulting in being identified out of the subject area and excluded, separating 626 articles from the articles. The similarity of articles was absent as all the journals belong to only the SCOPUS database. Further, 570 articles were excluded as not relevant, leaving only 56 articles being chosen for checking the eligibility for the next stage. Further, an article(Da Silva et al., 2022)whose only abstract is available in English is removed from the final selected articles. A total of 55 articles were selected for further systematic literature review.

Analysis

- **Content Analysis**

In this section, the 55 reported articles that were selected by following the PRISMA flowchart were presented. This chart was segregated into the name of the author, various behavioral bias variables, and the different subject groups they belong to.

Table 3: The themes of investors' behavioral bias in investment decision-making.

SL No	Author	Behavioral Bias Variable								Subject Area		
		LA	OC	MT	CM	AC	AL	RG	HD	SS	BMA	EEF
1.	(Y. Chen & Ma, 2009)							✓		✓		
2.	(Madaan & Singh, 2019)		✓			✓			✓			✓
3.	(Birnbaum & Schmidt, 2008)							✓			✓	✓
4.	(Almansour et al., 2023)		✓						✓			✓
5.	(Benayad & Aasari, 2023)		✓									✓
6	(Nobre et al., 2022)	✓	✓					✓		✓	✓	
7	(Paul & Sundaram, 2023)		✓						✓	✓		
8	(Ullah et al., 2020)		✓						✓	✓	✓	✓
9	(Quang et al., 2023)		✓						✓		✓	✓
10	(Ponce & Lemaroy, 2023)			✓					✓		✓	

11.	(Hasan et al., 2023)				✓						✓	
12	(Parmitasari et al., 2022)		✓								✓	✓
13	(Mohanty et al., 2023)		✓		✓					✓	✓	
14.	(Budescu & Du, 2007)		✓								✓	
15.	(Sharma & Firoz, 2020)			✓					✓		✓	✓
16	(Shantha & Vedantam, 2019)			✓	✓		✓				✓	✓
17	(Bihari et al., 2023)	✓	✓					✓		✓	✓	
18	(Blasco et al., 2012)								✓			✓
19	(Sudirman et al., 2023)					✓	✓				✓	✓
20	(Hopfensitz & Van Winden, 2008)							✓		✓		✓
21	(Parveen et al., 2020)		✓									✓
22	(Hossian & Siddiqua, 2022)	✓	✓						✓	✓	✓	✓
23	(Kamran et al., 2022)						✓				✓	✓
24	(Rasool & Ullah, 2020)	✓	✓	✓		✓	✓	✓	✓			✓
25	(Shah et al., 2018)		✓			✓	✓					✓
26	(Jain et al., 2023)		✓			✓	✓				✓	✓
27	(Qasim et al., 2018)		✓						✓		✓	
28	(Khilar* & Singh, 2019)		✓								✓	
29	(Invernizzi, 2018)		✓								✓	✓
30	(Srinivasan & Karthikeyan, 2023)	✓	✓	✓		✓	✓	✓	✓		✓	✓
31	(Iram et al., 2023)		✓			✓	✓				✓	
32	(Meka & Tosku, 2023)		✓			✓			✓		✓	
33	(Bouteska & Regaieg, 2020)	✓	✓									✓
34	(Glätzle-Rützler et al., 2015)	✓									✓	✓
35	(Graves & Ringuest, 2018)		✓								✓	
36	(Bao & Li, 2016)		✓									✓
37	(Ghani et al., 2023)		✓								✓	
38	(Dittrich et al., 2005)		✓									✓
39	(Ahmad, 2020)		✓						✓			✓
40	(Combrink & Lew, 2020)		✓				✓					✓
41	(Ronay et al., 2017)		✓							✓		
42	(Kudryavtsev et al., 2013)						✓		✓	✓	✓	✓
43	(Bouteska et al., 2023)		✓								✓	✓
44	(Malik et al., 2021)		✓					✓	✓		✓	✓
45	(Philippas et al., 2020)								✓			✓
46	(L. Bogan et al., 2013)	✓									✓	✓
47	(Pertiwi et al., 2019)		✓								✓	
48	(Hala et al., 2020)	✓	✓					✓	✓		✓	✓
49	(Mohmed & Bassam, 2022)		✓	✓					✓		✓	
50	(Piehlmaier, 2023)		✓							✓	✓	✓
51	(Jonas et al., 2008)				✓					✓		
52	(Sabir et al., 2019)		✓						✓	✓	✓	✓
53	(Hatoum, 2021)		✓									✓
54	(Moueed & Hunjra, 2020)								✓			✓
55	(X. Chen et al., 2017)		✓									✓

Note: LA- Loss Aversion; OC- Overconfidence; MT- Mentality; CM- Confirmation; AC- Anchoring; AL- Availability; RG- Regret; HD-Herding; SS- Social Science; BMA- Business, Management and Accounting; EEF- Economics, Econometrics and Finance

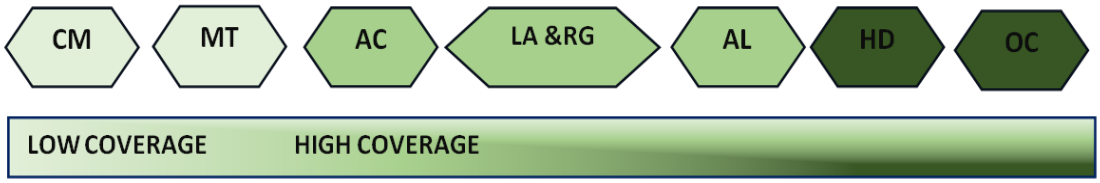

Figure 2: Coverage of Various Behavioral Biases Variables in Ascending Order

The prevailing themes were behavioral bias and particularly subject areas containing eight and three distinctive studies, respectively. The most common behavioral bias is investors' overconfidence bias and herding bias has been identified. Meanwhile, overconfidence bias is discussed and studied in 39 articles and herding is covered in 21 articles out of 55 articles, individually. Further, it was analysed that 15 articles commonly talk about both overconfidence and herding biases. However, a good number of literature shave created a place as a mediating and managing mechanism among variables. Those biases that are relatively less discovered in the behavioral bias literature were investment-specific. **Figure 2,** further shows the coverage of variables by the researchers in the Ascending order (left to right). In addition to this segregation, literature from the EEF area and BMA area put their dominance over the studies related to behavioral bias

- **Word Cloud**

The word cloud analysis has been identified as a graphical display of the most commonly occurring words and critical keywords within past research, helping fast acknowledgment and developing prominent themes and significant terms.(Fadhel et al., 2024)It is significantly valuable in the systematic literature review to synthesize large volumes of data and useful for associating the thematic focus of distinctive articles or journals, delivering insights into the progression of research articles. We utilize Atlas. ti Software, version 9.1.3.0, to create a word cloud to create a comprehensive view for this article. We preferred to set a spiral graph for layout and exclude single-character words, numbers, hyphens, and underscores for better acknowledgment of words that can influence the literature. We found that the word Investment occurs (1248 times), followed by Decision (1147 times), Risks (1174 times), Investors (1129 times), and Overconfidence (733 times).

Figure 3: Word Cloud

- **Initial Network Visualization**

These 55 articles were saved into the ".csv" file format for additional analysis in VOSviewer, application version 1.6.19. After that, the following process was followed for an initial network visualization: a) prepared a CSV file. b) then create a map based on bibliographic data under choose type of data, c) Read data from bibliographic database files, d) Choose Scopus from the upper text bar, e) Then choose a CSV file from the folder, f) Choose the type of analysis and counting method, we set co-occurrence route in type of analysis, all keyword route in Unit of analysis and Full counting route in Counting Method, g) the next process is to verify the selected keywords and last, h) presenting the network.

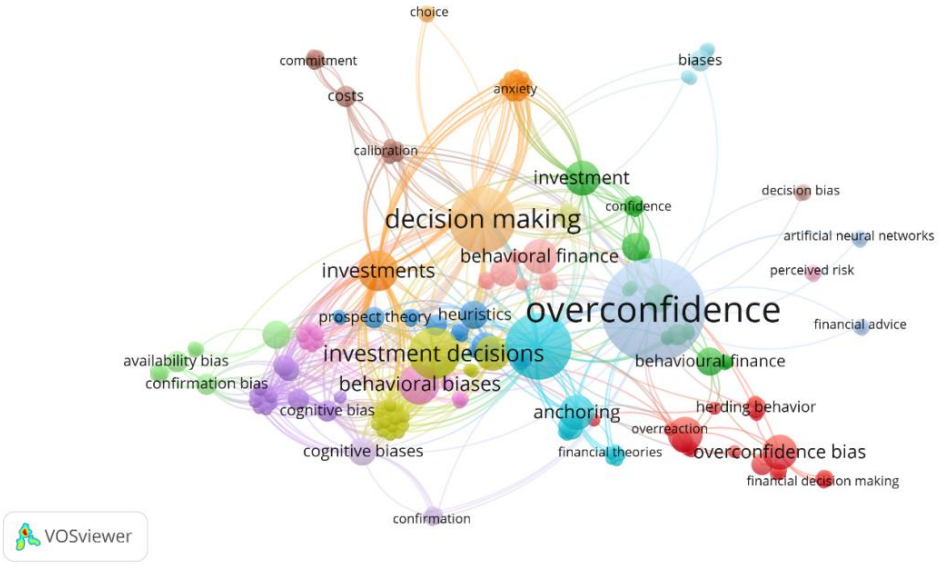

Figure 4: Initial Network Visualisation of All Keywords

According to the primary result of the analysis, visualization of the network recognizes clusters, trends, and arrays within the information set by showing items as nodes and their networks as lines. The size of nodes and color, width of the linked lines, show the frequency and strength of these relations. Through VOSviewer Software, as shown in **Figure 4**, It was identified that Overconfidence, cognitive biases, confirmation bias, availability biases, herding behavior, and investment were all linked up with individual Investments and decision-making. Whereas, some keywords that are distantly connected with the flow of the study are anxiety, choice, commitment, costs, calibration, artificial neural networks, and prospect theories.

- **Citation Analysis Network**

Table 4: 10 Most Cited Articles based on selected articles by following the PRISMA Model (May 2024)

Sl.	Publication	Citation	Keywords	Country
1	Does Herding affect Volatility? Implications for the Spanish Stock Market (Blasco et al., 2012)	107	Herding, Capital Market, Behavioral Finance, Volatility	Spain
2	Heuristic biases in investment decision-making and perceived market efficiency: A survey at the Pakistan stock exchange (Shah et al., 2018)	93	Heuristics, Overconfidence, Representativeness, Availability, Anchoring, Investment Decision and Market Efficiency	Pakistan
3	Overconfidence in investment decisions: An experimental approach (Dittrich et al., 2005)	58	Risky Decision Making, Behavioral Finance, Portfolio Choice	Germany

4	Exploring market overreaction, investors' sentiments and investment decisions in an emerging stock market (Parveen et al., 2020)	45	Overconfidence Bias, Representative Heuristic, Past Returns, Investor Reactions	Pakistan
5	Coherence and consistency of investors' probability judgments (Budescu & Du, 2007)	45	Overconfidence, Calibration, Confidence Intervals, Probability Judgements, Investment Decision	USA
6	Signal-herding in cryptocurrencies (Philippas et al., 2020)	43	Signal Herding, Conditional Herding, Cryptocurrency	France
7	An experimental investigation of violations of transitivity in choice under uncertainty (Birnbaum & Schmidt, 2008)	42	Decision Making, Regret, Transitivity	Germany
8	Rational" or "intuitive": Are behavioral biases correlated across stock market investors? (Kudryavtsev et al., 2013)	37	Availability heuristic, Disposition Effect, Herd Behavior, Hot Hand Fallacy	Israel
9	The role of overconfidence and past investment experience in herding behaviour with a moderating effect of financial literacy: Evidence from Pakistan Stock Exchange (Sabir et al., 2019)	36	Overconfidence, Past Investment Experience, herding Behavior	Pakistan
10	Financial literacy and behavioural biases of individual investors: empirical evidence of Pakistan stock exchange (Rasool & Ullah, 2020)	35	Behavioral Finance, Behavioral Biases, Financial Decision-Making, Financial Literacy, Individual Investors	Pakistan

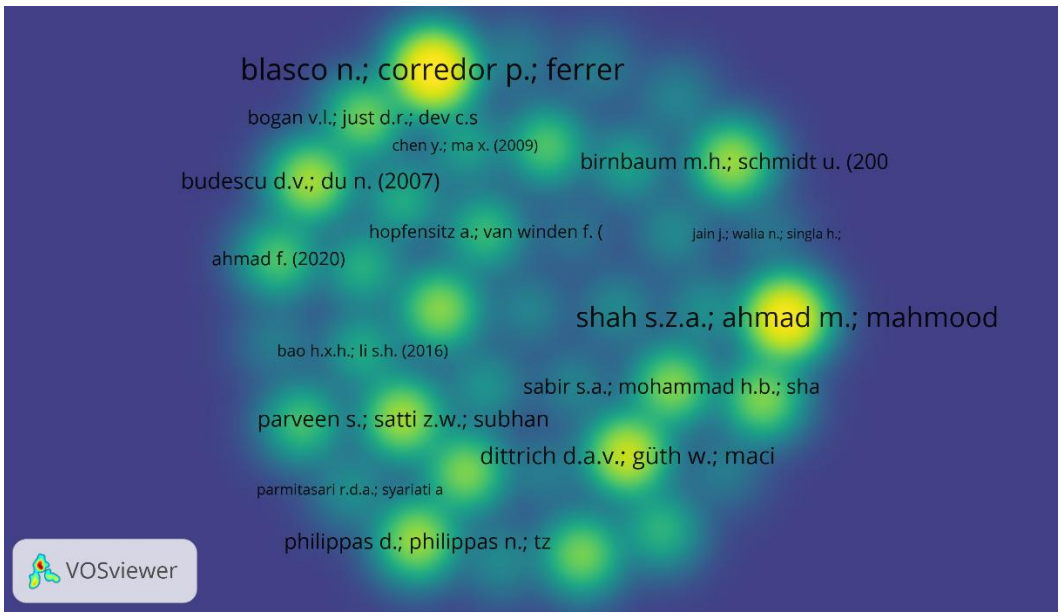

Figure 5: Density Visualization Cluster of Behavioral Biases with Investment Decision Making (minimum no. of citation of document = 3)

After reviewing **Table 4**, it was found that four out of the top ten cited articles belong to a similar country that is Pakistan(Parveen et al., 2020; Rasool & Ullah, 2020; Sabir et al., 2019; Shah et al., 2018).

Table 5: Top 10 countries with the most no of articles produced with citations based on selected articles limited to the subject area and before the screening process

Sl No	Country	No. of Articles	Citation	Sl No	Country	No. of Articles	Citation
1	United States	128	4019	6	Italy	38	1215
2	United Kingdom	111	2770	7	Germany	37	955
3	Australia	48	1163	8	India	29	658
4	China	42	684	9	Spain	25	784
5	Netherlands	41	961	10	Canada	20	433

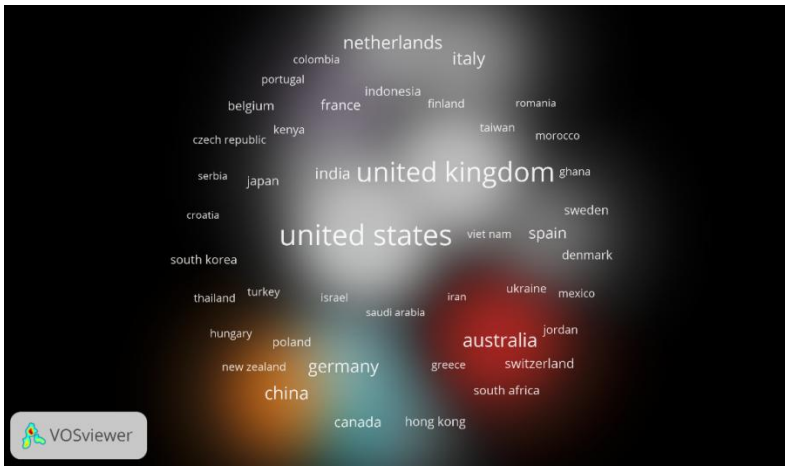

Figure 6:. Density visualization of contribution cluster of various countries according to selected articles limited to the subject area and before the screening process

Table 6: The top 10 countries with the most no of articles.

Sl No	Countries	No. of Articles	Citation	Sl No.	Countries	No. of Articles	Citation
1	Pakistan	9	228	6	Indonesia	4	29
2	India	9	48	7	China	3	12
3	United State	7	220	8	France	3	52
4	United Kingdom	5	66	9	Italy	3	29
5	Germany	4	126	10	Malaysia	3	43

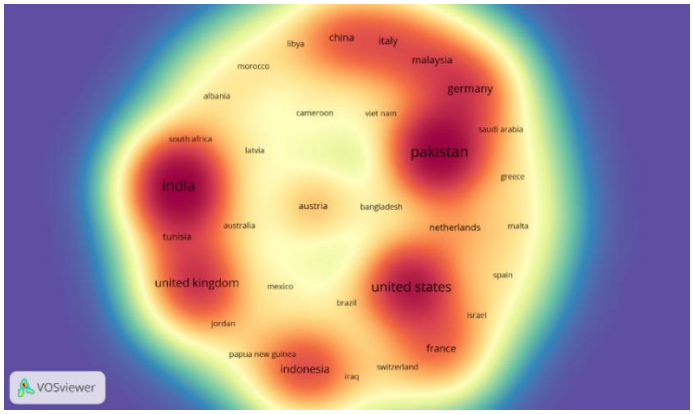

Figure 7: Spectral Density visualization of contribution cluster of various countries

The **Figure 7**, illustrates the spectral view of countries that produce the cluster that denotes the country's contribution in the research field. The larger the size of the red spot in the plasma visualization shows the highest involvement of the country in research paper contribution. Pakistan and India share the largest red circle and have the highest contribution in this field, followed by the USA and United Kingdom.

- **Knowledge Mapping**

In the systematic literature review, knowledge mapping is the term, that has been commonly addressed in recent times, known for its numerical analysis of publication in this discipline. The two most prominent methods viz. co-citation and co-occurrence are the main analysis instruments. Co-occurring analysis in VOSviewer concludes the identification and visualization of the data frequency and connection among a couple of items, such as keywords, prominent authors, journals, and countries. Whereas, the other instrument co-citation network analysis covers the journals, articles, and authors of selected articles with the highest citation occurrence. The gap among the couple journals in the visualization indicates the affiliation of the journals in the span of the co-citation family. In general, the proximity of the two articles points out the strength of the relatedness.

In the keyword Co-occurrence analysis, we try to recognize the switching trends of research in the passage of time, so we can understand the recent research flashpoint. It is a bibliometric technique that is utilized to visualize the association among keywords within a filtered article. The tendency of coming together in a document makes it is easier to analyze paradigms, trends, and the graph of knowledge just by examining the keywords within a particular boundary. Our analysis is through VOSviewer, which is used for Keyword network analysis under Co-occurrence for different network maps. We identify a total of 225 All Keywords, 190 Author Keywords, and 56 Index Keywords. The most appeared keyword was identified as Overconfidence(19 times), Decision-making(10 times), and Investment Decision (10 times) in All Keywords. **Figure no. 5,** as presented, Initial Network Visualization of all keywords, significantly sparks the existence of these reappeared keywords as circles or nodes. Keywords that epitomize bigger circles mean the appearance frequently across the study attempted and show cased in the research field. Whereas, **Figure No. 9,** is the overlay visualization map of the author's co-occurrence keyword, showing the significant transformation of the perceived keyword over time. the nodes represented in yellows show the gravity engagement of particular keywords in recent or future research.

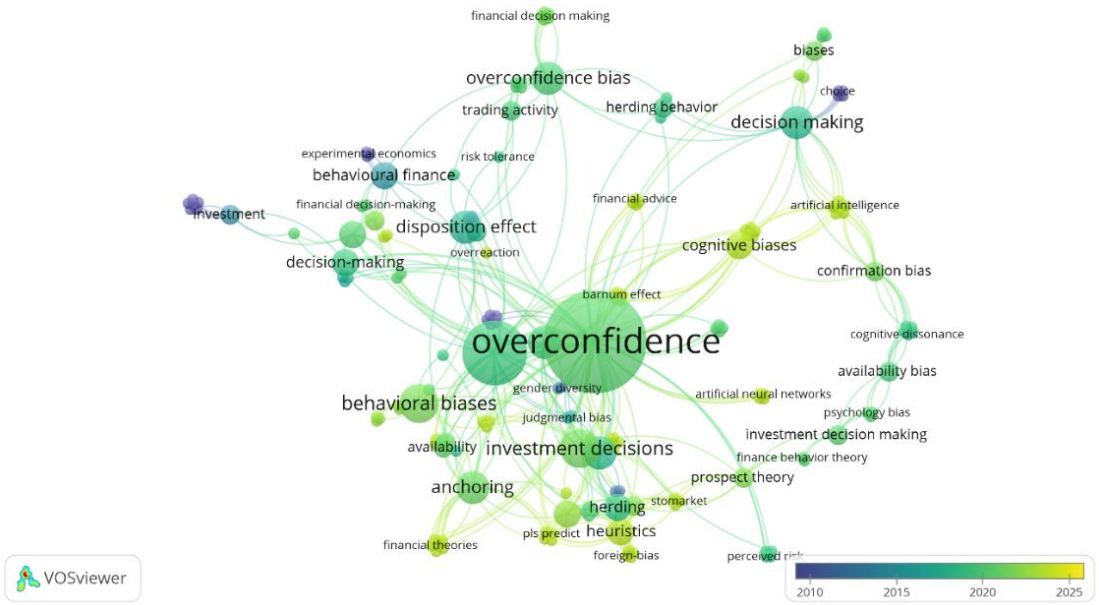

Figure 8: Overlay visualization of all author co-occurrence keywords

The bibliometric Co-citation analysis is a scientific analysis tool that was used to analyze the network of connected journals, authors, and other related documents.**Table No. 7**, presents the first top 10 co-cited analyses of authors.

Table 7: Author Co-Citation Results

Sl No.	Author	Country	Co-Citation	Total links (min Docs = 5)	h Index	Total Scopus Citation	Institution
1.	Kahneman Daniel	USA	107	4631	89	110470	Princeton School of Public and International Affairs
2.	Tversky Amos	Israel	92	3992	72	97322	Hebrew University of Jerusalem
3.	Odean Terrance	USA	80	4019	25	14617	Haas School of Business
4.	Hirshleifer David	USA	49	2607	50	19168	National Bureau of Economic Research
5.	Thaler Richard	USA	41	2059	54	39246	The University of Chicago Booth School of Business
6.	Nofsinger John R	USA	35	1906	27	3477	University of Alaska Anchorage
7.	Barber Brad M	USA	34	1805	34	15455	UC Davis Graduate School of Management
8.	Shefrin Hersh M	USA	30	1485	14	3901	Santa Clara University
9.	Statman Meir	USA	30	1460	28	6520	Santa Clara University
10.	Barberis Nicholas	USA	23	1169	23	9742	School of Management

Source: Authors based on VOSviewer Results.

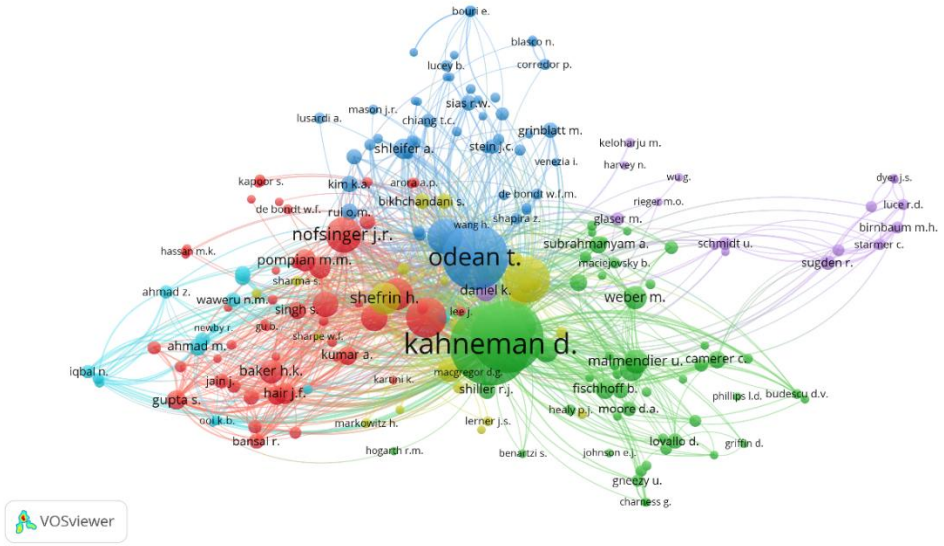

Figure 9: Network visualization of cited authors in Co-citation(minimum no of citation of an author = 5 Documents)

The Co-citation network is to find out the most impactful author for that specific area of literature. It is a practice used to map and visualize the significant association among authors according to the frequency with which it is cited in the theoretical study. The analysis software, VOSviewer is used because Cite Space is programmed to use the abbreviation of the complete name of the author. We set a minimum no. of citations of an author is 5, and we meet 4994 authors, but only 206 authors precisely meet the threshold. As shown in **Table 7**, the most no. of co-cited authors in this review were (Kahneman & Tversky, 1979), followed by (Tversky & Kahneman, 1974) and (Odean, 1998) with co-citation around 107 times, 92 times, and 80 times, respectively, and shares total links with minimum no. of authors in a document of 4631 times, 3992 times, and 4019 times respectively. It is so comprehensive to understand the dominance of the USA in this respective field.

The author's Co-citation explores the existing correlations in the middle of researcher son the ground of citation patterns. The main aim of this analysis is to expose the structure and highlight the potential contributors to this theoretical research study, with the ground of a higher understanding of this theoretical landscape. **Figure No. 10**, shows the network visualization of a total 206 authors co-citation with 6 distinct clusters. The highest no. of authors grouped in 'Cluster 1'is 52, shown in red nodes, followed by 'Cluster 2', shown in green nodes with 51 authors. The smallest cluster is 'Cluster 6' with only 14 authors shown in Sky Blue nodes. The method of association strength was particularly followed for the normalization throughout the analysis of the data. The total link strength amounts to the strength between behavioral bias and decision-making variables.

- **Bibliometric Coupling**

The final step in the analysis chapter is to explore various behavioral biasesin Investment decision-making by bibliographic coupling. Bibliographic coupling analysis shows the common shared referencesamong two individual articles. That means if they cite the same authors or from the same sources, they are meant as bibliographic coupled. **Table No. 8** presents the sources of the articles with the most no. of citations on various behavioral biases. The journal with the highest number of citations is Qualitative Research in Financial Markets, with 117 citations whereas Quantitative Finance Journalfollows in this list with 107 citations. Journal of Experimental Social Science is identified as the sole journal that brought a minimum of 3 documentsthreshold. Six individual journals, viz. Quantitative Research in Financial Markets, Journal of Economics, Finance, and Administrative Science, Journal of Experimental Social Psychology, Journal of Asian Finance, Economics, and Business,Cognent Economics, and Finance and Risks Journal areidentified under the threshold of a minimumof 2 documents. We set the minimum number of citations at the lowest to Zero, so no recent publication is castigated.

Table 8: Sources Bibliographic coupling result

Sl	Sources Journal	Documents	Citation	Link Strength
1.	International Journal of Financial Research	3	39	47
2.	Quantitative Research in Financial Markets	2	117	51
3.	Journal of Economics, Finance, and Administrative Science	2	59	45
4.	Journal of Experimental Social Psychology	2	39	5
5.	Journal of Asian Finance, Economics and Business	2	10	29
6.	Cogent Economics and Finance	2	10	25
7.	Risks	2	10	10
8.	Quantitative Finance	1	107	3
9.	European Journal of Finance	1	58	5
10.	Borsa Istanbul Review	1	45	41

Source: The author based on VOSviewer result.

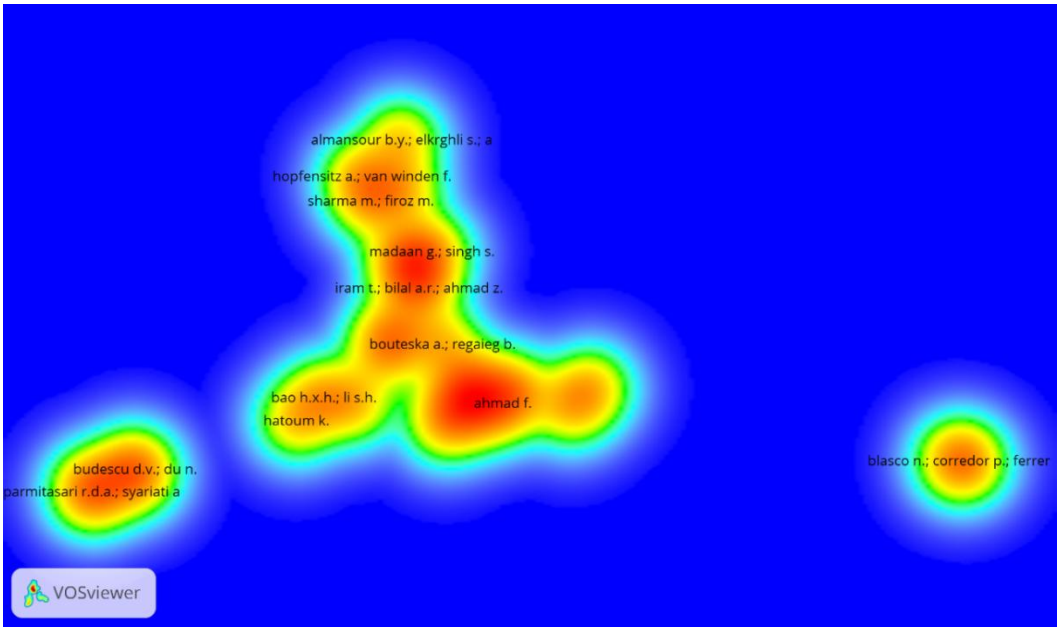

Figure 10: Plasma Density Visualization of bibliographic coupling network of the authors (minimum 5 citations)

In the bibliographic coupling analysis of the authors in the behavioral bias field, we discover a total of 55 authors. However, only 32 meet the filter of at least 5 minimum no of citation threshold. **Table No. 4** shows the list of top articles with the most number of citations. The author (Blasco et al., 2012) identified the most prominent author which can be seen as the red plasma circle in the downright corner of **Figure 10**, which concentrated their field of study on Herding Biases. **Figure 10,** shows the plasma visualization of other top authors.(Budescu & Du, 2007; Parmitasari et al., 2022) identified in the left-down corner side and mainly concentrated on the work over overconfidence behavioral Bias. The group of clusters in the middle of **Figure 10**, represents the significant same area and closeness and centrality of the paper. That means the nearer they are, the chances of coming together is greater. However, **Table No. 3** already identified overconfidence behavioral bias as the most adaptive topic for the study in this area.

Research Questions

For the **RQ1**, we have elaborated and segregated the behavioral bias themes into subthemes and named them into various behavioral biases. Our first question was to detect the particular behavioral bias that mostly pop up in the articles. We go through all the selected papers and mark the behavioral biases, in **Table No. 3**. The significance of the research question was proved after an all-inclusive study, that Overconfidence bias pops up and studies in seventy percent of the studies. The dominance of a single behavioral bias all over the study is notable. (G. Chen et al., 2007) argues overconfidence as the most common behavioral bias in humans supports the analysis. However, herding bias was identified as the second most renounced behavioral bias. The study conducted by (Sabir et al., 2019) revealed a positive relationship between the two most studied behavioral biases, i.e. Overconfidence and Herding biases with stock market investors.

In terms of the **RQ2**, we were objectified to analyze the subject area that signifies the most studies. By assisting these articles to a particular distinctive subject area, researchers can make their literature work identifiable without any problem to other researchers in the same research field, which ornamented the chances of citation and acknowledgment. In **Table No. 3**,We found that most of the articles are in the subject area of Economics, Econometrics & Finance with almostsixty-sevenpercent coverage, followed by Business, Management & Accounting field. The required answer for **RQ3**, we get from co-citation analysis of authors. The question was to find out the most prominent author in this subjective field. **Table 7**, presents Kahneman Daniel (Kahneman & Tversky, 1979)as the most

pronounced author in this respective field, sharing the 107 co-citations in this paper with the strongest total link of 4631. According to the SCOPUS database, he engages with 110470 citations with 89 h indexation. Followed by Tversky Amos (Tversky & Kahneman, 1974) as the second most prolific author in this subjective field with 92 co-citation marks and 3992 links strength shared in this particular study. His SCOPUS credentials engage with 97322 citations and 72 h index marks. Odean Terrance is identified as the third productive author in this field. The analysis presents that 9 authors out of 10 most prolific and proficient authors come from the same country which is the United States of America (USA). And the last **RQ4** is to deliver the most cited article in this study. Citation analysis in **Table No. 4**, shows the highly cited literature work that has made a significant contribution to this study. With 107 citations Does Herding Affect Volatility? Implication for the Spanish Stock Market (Blasco et al., 2012) identified as the most cited article among the selected articles, followed by the article Heuristic Biases in Investment Decision-Making and Perceived Market Efficiency: A Survey at the Pakistan Stock Exchange(Shah et al., 2018)

Conclusion Remark

Behavioral Bias has significantly put on momentum in the year between 2010-2024. It has been seen as a trendof significant variation in the research interest of investors. In **Figure 8**, overlay visualization ofthe author co-occurrence keyword shows the comprehensive overview of changing patterns in selecting keywords for research studies. Moreover, these behavior biases play a certain role for people since they want sound and solid investment decisions. Investors' decision-making is believed to be the highly crucial decision among all financial decisions(García-Sánchez & García-Meca, 2018; Kamran et al., 2022). Behavioral biases can affect the decision-making process.(Bhatia et al., 2020) suppressed the fact that Money and Investment may have repercussions as these biases can reproduce many wrong and loss-making decisions.

This research indicates that behavioral biases such as confirmation bias, availability bias, anchoring bias, or Loss aversion bias are still passive topics to connect the literature flow. This analysis further depicted the positive involvement and influence of overconfidence in investors' decisions. Many studies were conducted on the Pakistan Stock Exchange making Pakistan as one of the countries with rich behavioral biases in experimental research studies. However, (Qasim et al., 2018)argue that information is not uniformly accessible to all, as Pakistan's market is not enlarged and resourceful. Further, author co-citation analysis results highlighted that authors from the USA mainly showed their potential interest in this subject field.

Based on the 55 articles retrieved from the International Scopus databases, we find out an upward trend among the researchers and academic scholars. The growth in academician interest in a particular subject field results in the comprehensive study of various high-impacted articles underlined. These underlined resources with advanced knowledge pave the way for researchers to conduct a collaborative study in the future. However, this study successfully provides far-reaching theoretical models and facts.

For future studies, the knowledge mapping analysis of "Behavioral bias in investment decision-making" presents a direction for research excellence and saves learning time for practitioners and specialists, and can apply the result of this study or start further by taking this study as a base work. This study not only saves academicians time but also helps and guides reading efficiency and presents key ideas and articles simultaneously. Apart from that, the author's co-occurrence keyword overlay visualization network in Figure 8, presents the recent keywords for study and is on track for further research.

Limitations

The discoveries in this paper have several limitations. The first limitation was that the study was based on articles that only belonged to the English language, creating a possibility of overlooking the other emerging and renounced research work as they are non-English. Further, we work only on articles that are full-length peer-reviewed journals, following the best procedure from the PRISMA Flow Chart, and outcast the workshop and poster papers. Another limitation is that since this study takes a particular amount of time to reach a certain level of citation, this creates a possibility that publications in recent years have not gained an ideal number of citations, which causes research deviations.

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Conflict of Interest

The authors declare no conflict of interest.

References

1. Abreu, M. (2019). How biased is the behavior of the individual investor in warrants? *Research in International Business and Finance*, *47*, 139–149. https://doi.org/10.1016/j.ribaf.2018.07.006
2. Ahmad, F. (2020). Personality Traits as predictor of cognitive biases: Moderating role of risk attitude. *Quantitative Research in Financial Markets*, *12*(4), 465–484. https://doi.org/10.1108/QRFM-10-2019-0123
3. Al Faruq, M. S. S., Sunoko, A., Ibda, H., & Wahyudi, K. (2023). Digital Learning Management using OpenAI ChatGPT: A Systematic Literature Review. *International Journal of Learning, Teaching and Educational Research*, *22*(12), 21–41. https://doi.org/10.26803/ijlter.22.12.2
4. Almansour, B. Y., & Arabyat, Y. A. (2017). INVESTMENT DECISION MAKING AMONG GULF INVESTORS: BEHAVIOURAL FINANCE PERSPECTIVE. *International Journal of Management Studies*, *24*. https://doi.org/10.32890/ijms.24.1.2017.10476
5. Almansour, B. Y., Elkrghli, S., & Almansour, A. Y. (2023). Behavioral finance factors and investment decisions: A mediating role of risk perception. *Cogent Economics & Finance*, *11*(2), 2239032. https://doi.org/10.1080/23322039.2023.2239032
6. Bao, H. X. H., & Li, S. H. (2016). Overconfidence and real estate Research: A Review of the Literature. *Singapore Economic Review*, *61*(4), 1–29. https://doi.org/10.1142/S0217590816500156
7. Barber, B., & Odean, T. (2000). Trading is Hazardous to your wealth: The common stock investment performance of individual investors. *Journal of Finance*, *55*(2), 773–806. https://doi.org/10.1111/0022-1082.00226
8. Benayad, K., & Aasari, R. (2023). Behavioural Bias and Investment Decision of SMEs Management. *International Journal of Financial Studies*, *11*(120). https://doi.org/10.3390/ijfs11040120
9. Berthet, V. (2022). The Impact of Cognitive Biases on Professionals' Decision-Making: A Review of Four Occupational Areas. *Frontiers in Psychology*, *12*, 802439. https://doi.org/10.3389/fpsyg.2021.802439
10. Bhatia, A., Chandani, A., & Chhateja, J. (2020). Robo advisory and its potential in addressing the behavioral biases of investors—A qualitative study in Indian context. *Journal of Behavioral and Experimental Finance*, *25*, 100281. https://doi.org/10.1016/j.jbef.2020.100281
11. Bihari, A., Dash, M., Muduli, K., Kumar, A., Mulat, W. E., & Luthra, S. (2023). Does Cognitive Biased Knowledge Influence Investment Decision? An Empirical Investigation using Machine Learning and Artificial Neural Network. *VINE Journal of Information and Knowledge Management System*. https://doi.org/10.1108/VJIKMS-08-2022-0253
12. Bikhchandani, S., & Sharma, S. (2001). Herd Behavior in Financial Market. *IMF STAFF PAPERS, International Monetary Fund*, *47*(3), 279–310.
13. Birnbaum, M. H., & Schmidt, U. (2008). An experimental investigation of violations of transitivity in choice under uncertainty. *Journal of Risk and Uncertainty*, *37*(1), 77–91. https://doi.org/10.1007/s11166-008-9043-z
14. Blasco, N., Corredor, P., & Ferreruela, S. (2012). Does herding affect volatility? Implications for the Spanish stock market. *Quantitative Finance*, *12*(2), 311–327. https://doi.org/10.1080/14697688.2010.516766
15. Bouteska, A., Harasheh, M., & Abedin, M. Z. (2023). Revisiting overconfidence in investment decision-making: Further evidence from the U.S. market. *Research in International Business and Finance*, *66*, 102028. https://doi.org/10.1016/j.ribaf.2023.102028

16. Bouteska, A., & Regaieg, B. (2020). Loss Aversion, Overconfidence of Investors, and their impact on market performance evidence from the US Stock market. *Journal of Economics, Finance and Administrative Science*, *25*(50), 451–478. https://doi.org/10.1108/JEFAS-07-2017-0081

17. Budescu, D. V., & Du, N. (2007). Coherence and Consistency of Investors Probability Judgements. *Management Science*, *53*(11), 1731–1744. https://doi.org/10.1287/1070.0727

18. Che Hassan, N., Abdul-Rahman, A., Mohd Amin, S. I., & Ab Hamid, S. N. (2023). Investment Intention and Decision Making: A Systematic Literature Review and Future Research Agenda. *Sustainability*, *15*(5), 3949. https://doi.org/10.3390/su15053949

19. Chen, G., Kim, K. A., Nofsinger, J. R., & Rui, O. M. (2007). Trading performance, disposition effect, overconfidence, representativeness bias, and experience of emerging market investors. *Journal of Behavioral Decision Making*, *20*(4), 425–451. https://doi.org/10.1002/bdm.561

20. Chen, T. (2013). Do Investors Herd in Global Stock Markets? *Journal of Behavioral Finance*, *14*(3), 230–239. https://doi.org/10.1080/15427560.2013.819804

21. Chen, X., Wang, Z., Deng, S., & Fang, Y. (2017). Risk measure optimization: Perceived risk and overconfidence of structured product investors. *Journal of Industrial & Management Optimization*, *13*(5), 1–20. https://doi.org/10.3934/jimo.2018105

22. Chen, Y., & Ma, X. (2009). Age Difference in risky decisions. *Educ Gerontal*, *35*(7), 575–586. https://doi.org/10.1080/03601270802605291

23. Combrink, S., & Lew, C. (2020). Potential underdog bias, overconfidence and risk propensity in investor decision-making behaviour. *Journal of Behavioral Finance*, *21*(4), 337–351. https://doi.org/10.1080/15427560.2019.1692843

24. Da Silva, Barbosa, J., & Labres, S. (2022). Heuristics in the Decision Making of High School Students when faced with Financial Situations. *Revista Brasileira de Educacao*, *27*. https://doi.org/10.1590/S1413-24782022270098

25. Daniel, K., Hirshleifer, D., & Subrahmanyam, A. (1998). Investor Psychology and Security Market Under- and Overreactions. *The Journal of Finance*, *53*(6), 1839–1885. https://doi.org/10.1111/0022-1082.00077

26. Dittrich, D., Guth, W., & Maciejovsky, B. (2005). Overconfidence In Investment Decision: An Experimental Approach. *European Journal of Finance*, *11*(6), 471–491. https://doi.org/10.1080/1351847042000255643

27. Fadhel, M. A., Duhaim, A. M., Saihood, A., Sewify, A., Al-Hamadani, M. N. A., Albahri, A. S., Alzubaidi, L., Gupta, A., Mirjalili, S., & Gu, Y. (2024). Comprehensive systematic review of information fusion methods in smart cities and urban environments. *Information Fusion*, *107*, 102317. https://doi.org/10.1016/j.inffus.2024.102317

28. Fernández, B., Garcia-Merino, T., Mayoral, R., Santos, V., & Vallelado, E. (2011). Herding, information uncertainty and investors' cognitive profile. *Qualitative Research in Financial Markets*, *3*(1), 7–33. https://doi.org/10.1108/17554171111124595

29. Fogel, S. O. C., & Berry, T. (2010). The Disposition Effect and Individual Investors Decisions: The Roles of regret and Counterfactual Alternatives. *Journal of Behavioral Finance*, *7*(2), 107–116. https://doi.org/10.1207/s15427579jpfm0702_5

30. Fong, P. S. C., & Wyer, R. S. (2003). Cultural, social, and emotional determinants of decision under uncertainty. *Organisational Behaviour and Human Decision Process*, *90*(2), 304–322. https://doi.org/10.1016/S0749-5978(02)00528-9

31. García-Sánchez, I., & García-Meca, E. (2018). Do talented managers invest more efficiently? The moderating role of corporate governance mechanisms. *Corporate Governance: An International Review*, *26*(4), 238–254. https://doi.org/10.1111/corg.12233.

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