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### "Mapping the field of cognitive sciences in behavioral finance"

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#### Abstract

This study aims to find the patterns and connections in cognitive sciences in behavioural finance among the existing papers in the Scopus and dimensions database between 2014 and 2024. The purpose of this paper is to map the field of Behavioural bias on the basis of the leading authors, journals, most prevalent biases, the factors affecting those biases. This study finds the most important contributing studies undertaken in this field and their citations impact, number of publications etc. By grouping papers, bibliographic coupling and co-citations among the authors helps in deeper understanding of the field of cognitive science and behavioural bias. Also factors that affect the most common types of biases are identified and isolated by using systematic literature review. This study considered only articles from the Scopus database. Future studies can be repeated based on other databases.

**Keywords-** Behavioural biases, cognitive sciences, co-citations, bibliographic coupling, Systematic literature review.

## Introduction

Behavioural bias describes people's systematic and predictable differences from rational decision-making in various circumstances. These biases affect how people think, analyze, and decide. Finance, psychology, economics and consumer behavior all have behavioural biases. Understanding these biases might help prevent irrational outcomes and judgement errors.

Behavioural economics and psychology have highlighted these biases. Prospect theory tells how people value possible losses and profits differently, resulting in risk-averse or risk-seeking behavior depending on the choice circumstances. Prospect theory is a foundational work on behavioural biases and uncertainty-based decision-making (Kahneman & Tversky, 1979).

Research on nudges showed how simple change in how a situation is presented can greatly influence decision-making. "Nudging" has implications for policymakers and investment institutions to help people make better judgements (Thaler & Sunstein, 2008).

Tversky and Kahneman explored anchoring bias, another common behavioural bias. This bias happens when people make decisions based on first received information on any topic. (Tversky and Kahneman, 1974) finds that the initial information has huge effect on decision making, regardless of relevance to a particular situation.

Tversky and Kahneman also discovered availability heuristic, a cognitive bias where people use recollection to predict future event. They observed that people overestimate the chance of media-covered or popular incidents in their decision making. (Tversky & Kahneman, 1973).

Recognizing these biases can help make better judgements and mitigate their effects. Understanding these biases can help policymakers and other decision-makers to take steps to reduce biases' negative effects and improve decision-making for individuals and society.

This paper examines some of the most common behavioural biases and can help understand how these biases affect investors decision-making by studying the latest research and evidence.

## Literature Review

Behavioural biases affect investing decision-making, and financial markets and individual investors have been studied. (Barberis and Thaler,2003) examined behavioural finance and identified biases that affect investment decisions and market outcomes. (Kahneman and Tversky,

1979) prospect theory shows how people evaluate possible benefits and losses differently, leading to risk-averse or risk-seeking behavior depending on the choice environment. (Shefrin and Statman, 1985) established the disposition effect, where investors sell winners too early and retain losers too long. (Odean, 1998) showed that investors are reluctant to recognize losses, resulting in inferior portfolio performance. (Rabin, 2002) examined the law of small numbers and how people make biased decisions based on inadequate evidence. (Barber and Odean, 2001) found that overconfident males trade more often. Weather and individual investor seasonality have also been researched. (Statman and Caldwell, 1987) examined gamblers' investment decisions. Researchers have extensively investigated behavioral biases in investing environments to understand their consequences and propose techniques to avoid them (Hersh Shefrin, 2000).

Systematic literature reviews are essential for evidence-based research. (Tranfield, Denyer, and Smart, 2003) presented a systematic review technique to gather and analyze research to inform management practices. (Kitchenham, 2004) provided instructions on organizing and conducting systematic reviews. (Grant and Booth, 2009) provided a typology of reviews, categorizing 14 review categories and their procedures. The PRISMA statement by (Moher et al., 2009) ensures transparent and complete reporting of systematic reviews in medicine. (Petticrew and Roberts, 2006) provided step-by-step instructions for systematic social science reviews. These literature reviews help researchers perform thorough and insightful systematic literature reviews in their disciplines and develop systematic review methodology.

Research evaluation and academic communication trends require bibliometric analysis. (Waltman, van Eck, and Noyons, 2010) proposed a unified method for mapping and grouping bibliometric networks, enabling research collaboration and knowledge transmission across scientific fields. (Leydesdorff and Rafols, 2009) built a worldwide science map based on ISI subject categories to reveal interdisciplinarity and collaboration tendencies across scientific domains. (Bornmann and Leydesdorff, 2014) described how bibliometrics has become a fundamental aspect of research quality evaluation, influencing research practice and financing and policy decisions. The Leiden Manifesto for research metrics by (Hicks, Wouters, Waltman, de Rijcke, and Rafols, 2015) promotes responsible and proper use of bibliometrics in research evaluation. Researchers, policymakers, and funding agencies should follow this manifesto to use bibliometric analysis responsibly and for research purposes. Researchers can learn about the latest methods, applications, and ethical considerations for bibliometric analysis by reading these literature reviews.

## Objectives

This study is undertaken in order to full fill the below stated objectives, based on the literatures studied on the topic.

1. To explore the factors influencing behavioral biases.
2. To identify the most prevalent biases in behavioural finance.
3. To identify the top authors, journals, and studies in the area.

## Methodology

The study has clear research objectives and uses systematic literature review and bibliometric analysis. Specific domains, topics, or research areas of interest for the study are identified. A comprehensive search strategy is developed to identify relevant available literature. Available online databases Scopus and Dimensions is used to access peer-reviewed articles, conference proceedings, and other scholarly publications. Appropriate keywords and controlled vocabulary terms relevant to the research topic is included (Tranfield, Denyer, & Smart, 2003). Specific inclusion and exclusion criteria are set to select studies that align with the research objectives. Eligibility is based on publication type, date, language, and relevance to the research questions (Kitchenham, 2004). A two-step screening process is undertaken. Initially titles and abstracts are reviewed to assess their suitability with this study. In the second step, full-text articles according to the predefined inclusion and exclusion criteria is accessed (Grant & Booth, 2009).

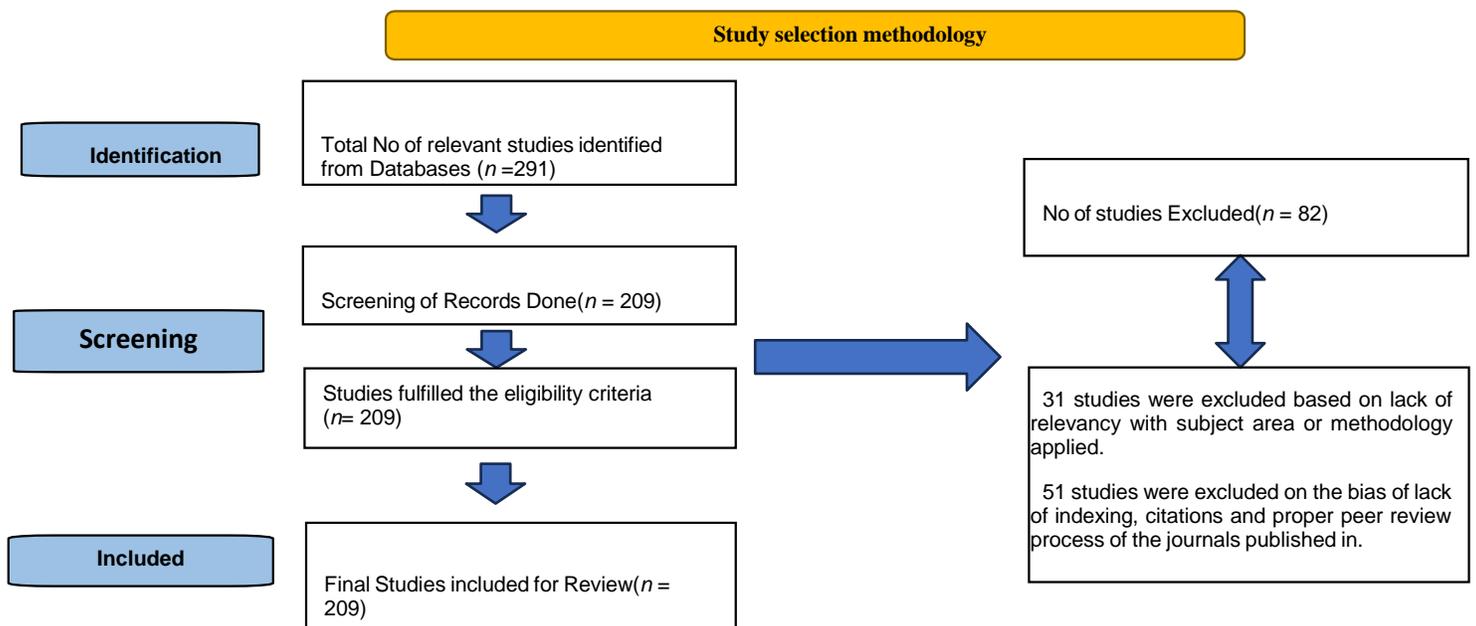
Network analysis utilizing VOS viewer and bibliometrics is a strong and extensively used process for studying scientific literature and identifying relevant trends, patterns, and correlations. VOS viewer, a popular software application, helps researchers to analyze and visualize bibliometric data including co-authorship, citation networks, and keyword co-occurrence (van Eck & Waltman, 2010). Network analysis helps researchers find significant authors, popular research topics, and research linkages. Bibliometrics uses citation counts and other bibliographic data to quantify publication and author influence (Jacso, 2008). VOS viewer and bibliometrics helps in evidence-based decision-making, collaboration and innovation in various academic field.

Systematic literature reviews identifies and analyses past available research on a particular topic. It entails systematically searching databases and other sources for relevant research that match inclusion criteria. A systematic literature review's main purpose is to get an unbiased, evidence-based summary of a topic's literature (Kitchenham et al., 2009). This method assures that study selection is objective and replicable by following a methodology, reducing bias and improving review findings. Data extraction, quality assessment, and data synthesis are used in systematic literature reviews to draw conclusions from the evidence (Tricco et al., 2018).

Relevant data from selected studies, including author names, publication year, citation counts, study methodologies, and key findings is extracted and organized in a standardized format for

analysis. Appropriate assessment regarding quality is ensured for the research domain to ensure the inclusion of reliable and valid sources (Kitchenham, 2004).

Bibliometric tool VOS viewer is used to analyze citation networks, co-authorship patterns, keyword co-occurrence, and other bibliometric indicators (Waltman, van Eck, & Noyons, 2010). Visualizations are generated to present the bibliometric analysis results, such as co-citation maps, keyword clusters, and author networks. These visualizations enhance the understanding of research trends and collaborations (Leydesdorff & Rafols, 2009). The findings from the systematic literature review and bibliometric analysis are analyzed to address the research questions. Results are interpreted to identify key themes, trends, and gaps in the literature (Bornmann & Leydesdorff, 2014). A detailed research report following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparent and comprehensive reporting of the study is prepared. (Moher et al., 2009).



## CONTENT ANALYSIS

Content analysis is an important and widely used study tool that looks at written, visual and audible content from different fields in a methodical and unbiased way. Researchers have placed significant importance on the utilization of this method in the analysis of qualitative data. To help academics in organizing and analyzing textual data, (Elo and Kyngäs, 2008) formed by a thorough qualitative content analysis process. The use of content analysis in research was discussed in detail

by (Schreier, 2014). Content analysis is a reliable process within the field of cultural studies. Using content analysis, (Potthoff, 2018) investigated "everyday mobility," exposing cultural norms. In order to understand human geography through textual analysis, (Bardin, 2013) emphasized the importance of content analysis. The methodological foundations and accomplishments of content analysis have been extensively documented in academic literature. Scholars received thorough instructions and insights from (Krippendorff, 2018) authoritative introduction to the approach. (Vaismoradi, Turunen, and Bondas, 2013) explores the application of content analysis within the field of nursing research. This methodology has the potential to contribute valuable insights to qualitative descriptive studies conducted in the healthcare domain. As demonstrated by (Neuendorf, 2016) and (Weber, 2017), content analysis is still a valuable research methodology.

High-quality academic journals prioritize the assurance of research authenticity. The significance of publishing in esteemed and influential academic journals cannot be overstated due to numerous factors. Initially, it serves to authenticate the findings of the investigation. Studies that have been peer reviewed and published in reputable journals are more likely to undergo expert review, which enhances study validity and accuracy (Peters & Ceci, 1982). Furthermore, esteemed academic journals enhance the visibility and dissemination of study findings. High-impact scholarly journals possess a substantial readership and are successful in attracting the attention of scholars, policymakers, and practitioners, hence enhancing the overall impact of the research (Ware & Mabe, 2015). Additionally, it is important to note that this study builds upon existing research and establishes a solid foundation for future investigations (Ioannidis, 2005). In addition to their scholarly contributions, researchers are evaluated based on the caliber and impact of their publications in esteemed academic journals (Teixeira da Silva & Dobránszki, 2015). The presence of reputable academic journals is of utmost importance within the scientific community due to their role in upholding the standards of research integrity, facilitating the widespread distribution of knowledge, and recognizing the contributions of researchers.

From the year 2000 to 2023, a total of 291 publications were published across 119 academic journals. The following compilation presents the ten journals that have published the highest number of articles in the field of behavioral finance. The table displays the total number of citations. The Pacific-Basin Finance Journal emerged as the journal with the highest number of

articles, totaling 47, and garnered a substantial number of citations, amounting to 1164. The table below presents more notable journals among the Top 10.

Source	Documents	Citations
finance research letters	16	227
international review of financial analy...	18	116
journal of behavioral and experiment...	34	483
journal of economic behavior and or...	14	192
journal of private equity	25	38
management science	17	534
pacific basin finance journal	26	440
qualitative research in financial mark...	24	509
review of behavioral finance	17	210
sustainability (switzerland)	16	102

Table.1: 10 leading journals by citations (source: compiled by author)

### Analysis of Authors



Fig. 1- 25 leading authors network by publication (source: compiled by author)

In the biggest network of authors possible for top 25 authors within the time frame of the study considered, Cass Robert Sunstein stand prominent with 20 publications to his name in the area of behavioral bias which can be identified from the size of the node corresponding the author.

### Author and studies analysis

Bibliographic coupling analysis is a popular method for assessing literary significance. Citation analysis uses the number of times a research paper is cited by other papers to determine its popularity (Ding and Cronin 2011; Xu et al. 2018). 89 research publications in this 198-node network were cited in the citation analysis as is depicted the network below. Studies from authors like (Daniel Kahneman 1998) and (Benartzi and Thaler 1995) are having significantly larger nodes depicting higher number of citations for their work. This also gives an idea about the significantly influential authors in the area based on the number of citations and citation mean.

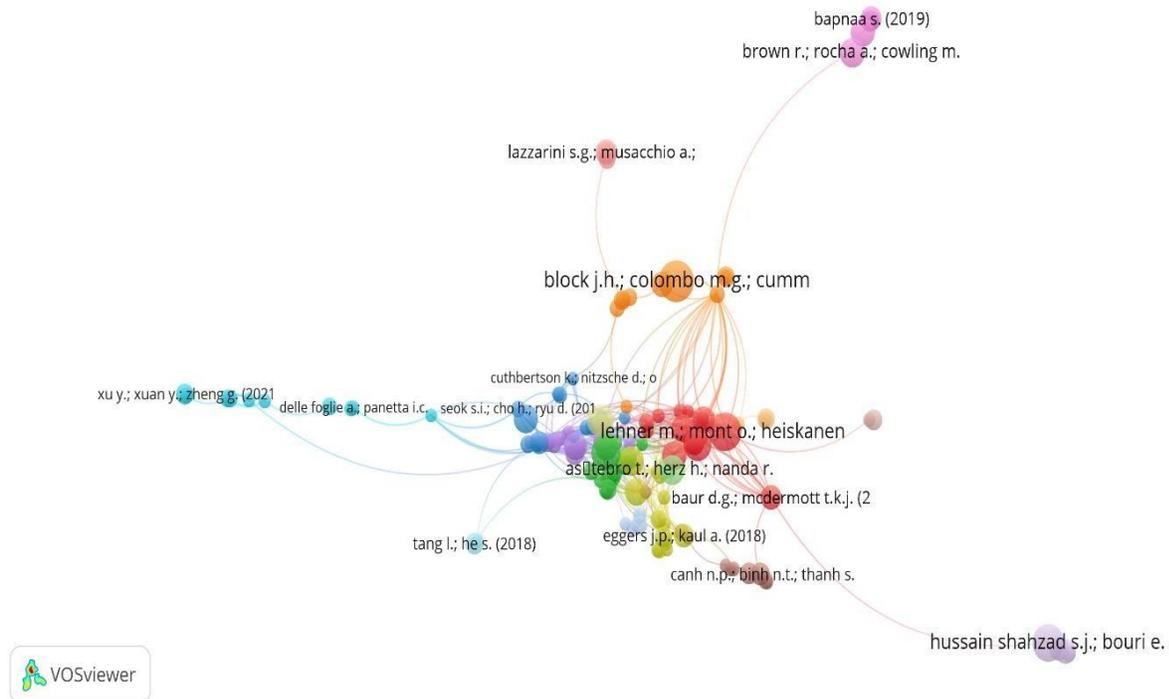


Fig.2: Biggest network of studies (source: compiled by author)

Author	Citations
kahneman d.	1322
tversky a.	1044
odean t.	783
hirshleifer d.	497
thaler r.h.	483
shleifer a.	534
fama e.f.	507
barber b.m.	374
statman m.	370
barberis n.	343
shefrin h.	328
kumar a.	284
thaler r.	340
grinblatt m.	267
subrahmanyam a.	244

*Table3.: 10 leading studies by citations (source: compiled by author)*

### Co-Cited authors

Co-citations shows the interconnection and effect of academic work, defining research quality and impact. Co-citations are how often two or more works are cited jointly in other publications' reference lists. A seminal or foundational research publication is often co-cited with other influential works (White & Griffith, 1981). Co-citation analysis is utilized in many fields to discover major contributions and intellectual lineages. (Small 1973) used co-citation analysis to identify the most significant works and authors in information science. Co-citation analysis has also tracked research subject evolution. (Leydesdorff and Vaughan 2006) used co-citation analysis to map communication studies' intellectual structure, revealing subfields' origins and interconnections. Researchers and policymakers can use co-citation patterns to assess the importance and relevance of scholarly output and track research trends.

The network below shows co-citation of the complete counting process using VOS viewer. Minimum citation threshold of 25 gave us three distinct clusters. Kahneman, D. Odean, T. has the most citations 79 with 1,613 link strengths in Cluster 1(red). Cluster 2 (green) has Shleifer, A. Subrahmanyam, A. has 22 citations and 504 link strengths. Hair, J.F. has 18 citations and 427

strengths in Cluster 3(blue). has 211 link strengths. Three clusters have 308 linkages and 7,429 link strengths.

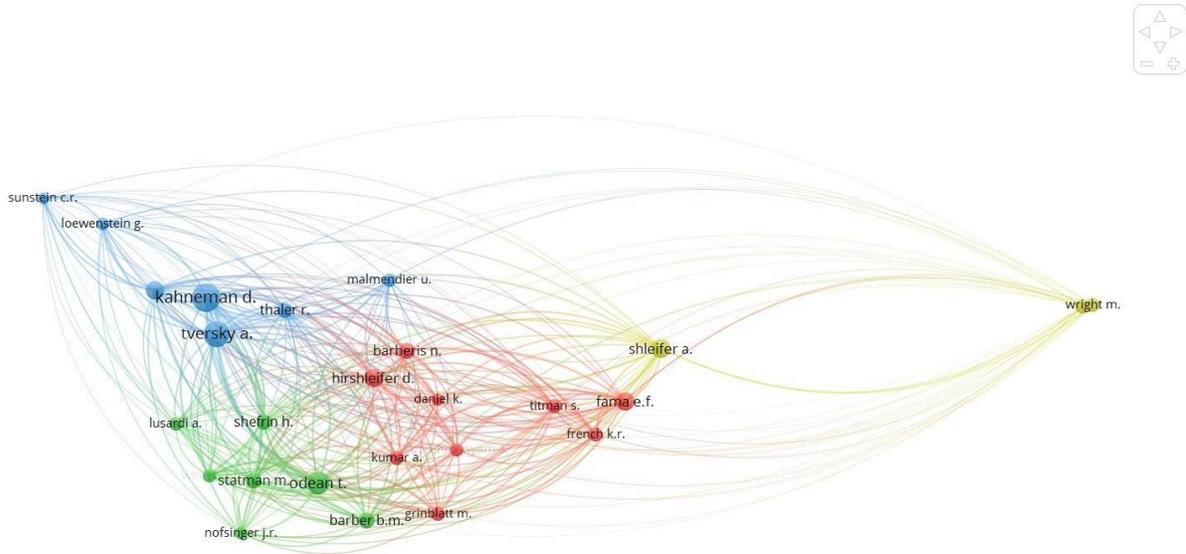


Fig.4: Biggest network of co-cited authors (source: compiled by author)

Country	Documents	Citations
australia	105	1236
canada	51	1069
china	211	1632
france	78	1559
germany	130	1915
india	220	1751
italy	82	1306
netherlands	60	1781
united kingdom	218	4213
united states	518	7292

Table4.: 10 leading countries by citations (source: compiled by author)

Table 4 lists the top 10 countries within the scope of the cutoff years for which the bibliometric study was undertaken

From the table, United States has most of the studies which has also garnered most of the citations during the period with more than 7000 citations and 500 articles within the scope of Scopus

database. India also is present in the list with over 220 articles which resulted in 1751 citation from Scopus indexed database. This show a spike in the articles on the relevant topic in the last ten years from India as compared to the previous bibliometric research has shown.

### Keyword analysis

Keywords appearing together in papers signal that their concepts are connected (Donthu et al., 2021).

Keyword analysis is crucial to the literature review process, revealing study area themes, trends, and gaps. Keyword analysis helps researchers find and choose relevant scientific papers that meet their research goals (Smith & Johnson, 2018). Researchers can easily explore enormous databases and academic repositories for suitable keywords and phrases to construct a well-rounded literature collection (Brown et al., 2020). Keyword analysis helps academics identify emergent concepts and their progression through time (Jones & Williams, 2019). Researchers can synthesize information from several sources, identify patterns, and identify knowledge gaps by organizing and categorizing literature using keyword analysis (Lee, 2017). Thus, keyword analysis helps researchers build a solid literature review, which leads to a more focused and informed research study.

In the figure below from, certain biases like herding, prospect and heuristics stands out. Also investment decision making, financial literary, investment decisions had significant presence in the analysis. Behavioural Finance has the most visible presence by the virtue of appearing in almost all the paper included in the study.

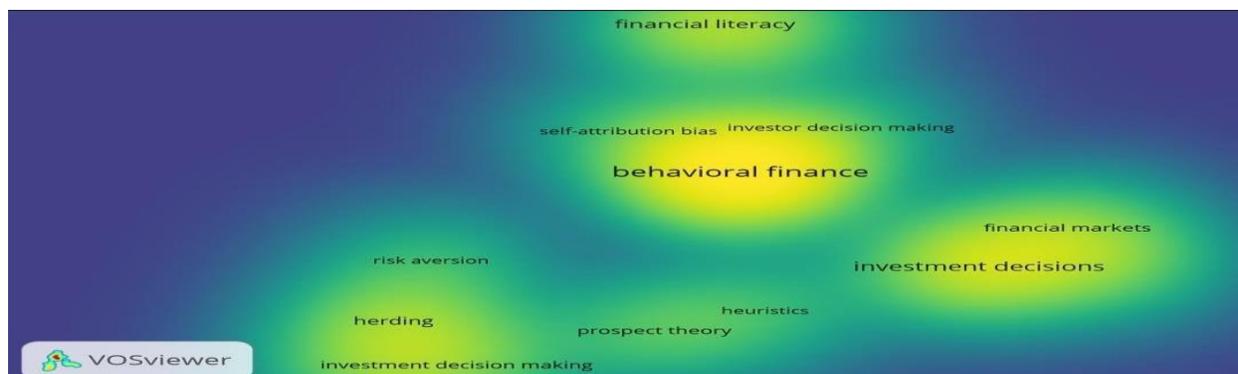


Fig.5: Density analysis of the keywords identified.

### Identification of biases

From the studies undertaken for the purpose of completion of these studies and subsequent content analysis of the same many biases were identified namely Representativeness, Availability, Anchoring, Confirmation, Halo Effect, Overconfidence, Sunk Cost, Prospect Theory, Framing Effect, Loss/ risk Aversion, Endowment Effect, Reference Dependence and Herding bias.

The identified biases are clubbed under three major biases bases on the density analysis as shown in the figure of density analysis given above. The basis of clubbing all the identified biases within the three main Biases are listed in the table below along with the referencing studies which suggested certain biases to be working under the frame work of the three major biases identified here, namely Heuristics, Prospect Theory and Herd bias.

<b>Biases</b>	<b>Reference studies</b>
<i>Heuristics Representativeness, Availability, Anchoring, Confirmation, Halo Effect, Overconfidence, Sunk Cost</i>	<i>Tversky, A., &amp; Kahneman, D. (1973), Kahneman, D., &amp; Tversky, A. (1972), Tversky, A., &amp; Kahneman, D. (1974), Nickerson, R. S. (1998), Nisbett, R. E., &amp; Wilson, T. D. (1977), Moore, D. A., &amp; Healy, P. J. (2008), Arkes, H. R., &amp; Blumer, C. (1985). Deb, S. S., &amp; Deb, S. (2024)</i>
<i>Prospect Theory, Framing Effect, Loss/Risk Aversion, Endowment Effect, Reference Dependence</i>	<i>Kahneman, D., &amp; Tversky, A. (1979), Tversky, A., &amp; Kahneman, D. (1981), Kahneman, D., &amp; Tversky, A. (1992), Kahneman, D., Knetsch, J. L., &amp; Thaler, R. H. (1991), Kahneman, D., &amp; Tversky, A. (1979).</i>
<i>Herding Bias</i>	<i>Banerjee, A. V. (1992), Bikhchandani, S., Hirshleifer, D., &amp; Welch, I. (1992), - Scharfstein, D. S., &amp; Stein, J. C. (1990), DEB, S. S., DEB, D. S., &amp; KHAN, S (2024)</i>

*Table.4: Table of the biases identified. (Source: compiled by the author)*

### Identification of factors

Personality, social, and environmental factors all affect behavioural biases. Real research have illuminated these influences. (Johnson and Tversky, 1983) showed how cognitive heuristics and biases can cause decision-making errors. Mental shortcuts like the availability heuristic can influence judgements and choices, they discovered. (Kahneman and Frederick, 2002) showed how

risk aversion and risk-seeking affect decision-making under risk using prospect theory. Personality traits also influence behavioural biases. (Dohmen et al. ,2010) found strong relationships between risk preferences and Big Five personality factors. Social influences matter too. Social proof causes conformity biases, as (Cialdini, 2007) showed. Culture also affects decision-making biases. (Kitayama et al.,2009) found cultural differences in cognitive processes, suggesting that individualistic and collectivist cultural norms influence behavioural biases. These studies have shown numerous linked elements that cause behavioural biases, highlighting the complexity of human decision-making in different settings.

Through literature review of the papers helped to identify the major factors that has had major influence in the three major identified biases. The factors for each of the three biases have been listed below along with the corresponding study they have been identified from. The factors are listed in three distinct tables as given below.

<b>Factors Influencing Herding Behavior</b>	<b>Reference Source</b>
<b>Uncertainty</b>	<i>Banerjee, A. V. (1992). A simple model of herd behavior. The Quarterly Journal of Economics, 107(3), 797-817.</i>
<b>Social Proof</b>	<i>Cialdini, R. B. (2007). Influence: The psychology of persuasion. HarperCollins.</i>
<b>Information Cascades</b>	<i>Bikhchandani, S., Hirshleifer, D., &amp; Welch, I. (1992). A theory of fads, fashion, custom, and cultural change as informational cascades. Journal of Political Economy, 100(5), 992-1026.</i>
<b>Fear of Regret</b>	<i>Zeelenberg, M., van Dijk, W. W., Manstead, A. S., &amp; van der Pligt, J. (2000). On bad decisions and disconfirmed expectancies: The psychology of regret and disappointment. Cognition and Emotion, 14(4), 521-541.</i>
<b>Media Influence</b>	<i>Barber, B. M., &amp; Odean, T. (2000). Trading is hazardous to your wealth: The common stock investment performance of individual investors. Journal of Finance, 55(2), 773-806.</i>
<b>Institutional Influence</b>	<i>Hong, H., &amp; Stein, J. C. (1999). A unified theory of underreaction, momentum trading, and overreaction in asset markets. The Journal of Finance, 54(6), 2143-2184.</i>
<b>Lack of Information or Expertise</b>	<i>Scharfstein, D. S., &amp; Stein, J. C. (1990). Herd behavior and investment. American Economic Review, 80(3), 465-479.</i>

Table5.: Factors influencing Herd behaviour (source: compiled by author)

<b>Factors Influencing Heuristic Behavior</b>	<b>Reference Source</b>
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<b>Cognitive Load</b>	<i>Payne, J. W., Bettman, J. R., &amp; Johnson, E. J. (1993). The adaptive decision maker. Cambridge University Press.</i>
<b>Decision Complexity</b>	<i>Simon, H. A. (1955). A behavioral model of rational choice. The Quarterly Journal of Economics, 69(1), 99-118.</i>
<b>Emotions</b>	<i>Loewenstein, G., Weber, E. U., Hsee, C. K., &amp; Welch, N. (2001). Risk as feelings. Psychological Bulletin, 127(2), 267-286.</i>
<b>Time Pressure</b>	<i>Brehmer, B., &amp; Hagafors, R. (1986). Dynamic decision making: Effects of task complexity and time pressure on information processing and decision quality. Acta Psychologica, 62(3), 179-199.</i>
<b>Framing Effects</b>	<i>Tversky, A., &amp; Kahneman, D. (1981). The framing of decisions and the psychology of choice. Science, 211(4481), 453-458.</i>
<b>Social Influence</b>	<i>Cialdini, R. B. (2007). Influence: The psychology of persuasion. HarperCollins.</i>
<b>Overconfidence</b>	<i>Odean, T. (1998). Are investors reluctant to realize their losses? Journal of Finance, 53(5), 1775-1798.</i>
<b>Mental Availability</b>	<i>Tversky, A., &amp; Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. Cognitive Psychology, 5(2), 207-232.</i>

Table6.: Factors influencing Heuristics behavior (source: compiled by author)

<b>Factors influencing Prospect theory Behavior</b>	<b>Reference Source</b>
<b>Loss Aversion</b>	<i>Kahneman, D., &amp; Tversky, A. (1979). Prospect theory: An analysis of decision under risk. Econometrica, 47(2), 263-292.</i>
<b>Reference Point Effects</b>	<i>Tversky, A., &amp; Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. The Quarterly Journal of Economics, 106(4), 1039-1061.</i>
<b>Diminishing Sensitivity</b>	<i>Tversky, A., &amp; Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. Journal of Risk and Uncertainty, 5(4), 297-323.</i>
<b>Probability Weighting</b>	<i>Tversky, A., &amp; Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. Journal of Risk and Uncertainty, 5(4), 297-323.</i>
<b>Framing Effects</b>	<i>Tversky, A., &amp; Kahneman, D. (1981). The framing of decisions and the psychology of choice. Science, 211(4481), 453-458.</i>
<b>Mental Accounting</b>	<i>Thaler, R. H. (1999). Mental accounting matters. Journal of Behavioral Decision Making, 12(3), 183-206.</i>

<b>Endowment Effect</b>	<i>Kahneman, D., Knetsch, J. L., &amp; Thaler, R. H. (1990). Experimental tests of the endowment effect and the Coase theorem. Journal of Political Economy, 98(6), 1325-1348.</i>
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*Table7.: Factors influencing Prospect theory biases (source: compiled by author)*

## Conclusion

This comprehensive literature review and bibliometric analysis revealed the most common investment decision-making biases, their causes, and their socio-economic and demographic influences. This study found that overconfidence, loss aversion, and anchoring are common in financial environments and may lead to suboptimal decisions. Investors, financial advisors, and legislators must understand these biases to develop measures to limit their negative consequences on financial results.

Psychological, cognitive, and emotional aspects influence investment biases. Prospect theory and mental accounting show that representativeness and availability affect investment decisions. Herding behaviour and social proof can magnify investment biases, causing market inefficiencies. Recognising these characteristics helps design treatments and decision-making frameworks that support rational and informed investment choices.

Socioeconomic and demographic characteristics also affect investment biases. Age, education, money, and culture all affect bias susceptibility, according to research. Lower socioeconomic groups may be more risk averse, whereas better education groups may be overconfident. Cultural norms and societal values influence people's risk and return estimations.

Researchers and practitioners must keep exploring new methods to understand and address investment biases. By using more comprehensive bibliometric analyzes and embracing new behavioural finance research, we can better understand investment decision-making and develop tailored interventions to promote more informed and rational investment decisions. This research lays the groundwork for future studies to improve financial decision-making and investors' well-being in a changing economy.

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