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Investment Decision-Making under Heuristics and the Paradigm of Behavioral Finance – A Bibliometric Analysis

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Abstract

Traditional finance theories are based on rationality of individuals acting as economic agents in the financial market. But individual investors are not always rational but prone to several cognitive and emotional biases. This study aims to map the scientific field of 'decision-making' under heuristic driven cognitive biases, viz. availability bias, mental accounting and representativeness and the theme of behavioral finance, economics, and accounting. Through bibliometric analysis this study would try to find out the most prominent authors, sources, articles, and, also, the intellectual, and collaborative structure through network analysis. Further, this study would try to find out the evolution of the aforesaid domain and, suggest future research agendas.

Keywords: Behavioral Finance, Availability Bias, Mental Accounting, Representativeness, Bibliometric.

1. Introduction

Classical finance theories are based upon the pillar of rationality of the individuals (economic agents) while making economic decisions. It implies that economic agents act according to the Savage's notion of Subjective Expected Utility (SEU) and update their prior beliefs upon arrival of new information, consistent with Bayes' laws (Barberis & Thaler, 2003,p. 1055). Over several decades finance academics and practitioners held the belief that humans are rational economic agents. But, during the 1980s several aggregate market anomalies prompted finance academics to scrutinize the long-held belief on rationality of economic agents. These anomalies showed that humans are not fully rational and they make mistakes while making choices resulting in sub-optimal portfolio. Behavioural finance emerged as a new frontier of research among finance academics who argued 'homo-economicus 'does not act according to the axioms of SEU rather, they are guided by simple rules of thumb or heuristics while making decisions in a complex situation and assessing probabilities of a set of risky outcomes (Tversky & Kahneman, 1974). Often these heuristics result in systematic errors called "biases." Prospect Theory (Kahneman & Tversky, 1979) discarded the axioms of SEU and showed that people are risk averse while making profit and are risk takers while incurring loss and people calculate their profit and loss from certain reference point rather than on the basis of the final outcome. In (Pompian, 2012) there are 20 biases (both cognitive and emotional), however, for this study only

three heuristics driven cognitive biases are considered, namely, 'availability bias', 'representativeness' and 'mental accounting', for the scientific mapping of the existing literature.

2. Preliminary Discussion on Heuristics and Investment Decision Making

Availability Bias

According to (Tversky & Kahneman, 1974) people tend to retrieve the frequency or subjective probability of an event from a class or population on the basis of the ease with which one can recall the occurrence of that particular event leading to a judgemental heuristic called 'availability'. Availability further leads to psychological bias which is systematic. Availability bias arises due to the presence of familiarity, salience, recency, effectiveness of search etc. (Tversky & Kahneman, 1981). Individuals fail to adhere to the normative principles laid down by SEU to conform to rationality due to the enormous amount of available information they face while making economic decisions (Pompian, 2012;p.101). Individual investors tend to buy only the stocks which attract their attention than those which do not, but while selling stocks individuals do not consider the attention grabbing stocks (Barber & Odean, 2008). Individuals face the complex task associated with choosing from a huge number of preferred stocks to buy from and they buy only those stocks which grab their attention in recent time (Odean, 1999). Seasholes and Wu (2004) found that individual investors, who were the first-time buyers, at the Shanghai Stock Exchange, were net buyers on the days on which the stocks they bought hit the price limit, also, they only bought those stocks which caught their attention. Individuals with negative emotions choose only those securities which they find favourable or attractive (Durand et al., 2013). Bakar and Yi (2016) found that availability bias has statistically significant effect on the stock purchasing decisions of individual investors in Malaysian stock market. Sadi et al. (2011) found existence of availability bias among individual investors in Tehran stock markets.

Representativeness Bias

While answering problems on probability estimation such as how likely it is that a particular event belongs to a particular population, people use a heuristic as to how much representative a particular event is of a certain class or population (Tversky & Kahneman, 1974). Representativeness bias creeps into practice when either individuals neglect the "base-rate" and / or neglect the "sample-size" in their real-life portfolio allocation strategy (Pompian, 2012;p.63). Kartini and Nahda (2021) found that representativeness bias has a statistically significant impact on the investment decision making process in Indonesia. Kariofyllas et al. (2017) found a significant association between representativeness bias and stock prices. Raut et al. (2020) found that representativeness bias has a significant impact on the individuals. Baker, Kumar, Goyal, et al. (2019) found representativeness bias is present among individual investors in India.

Mental Accounting Bias

In mental accounting people first estimate their pay-offs from economic transactions using prospect theoretic principles (valuation of loss and gain), then they categorize each of their assets into different nonfungible categories (mental accounts) and finally they evaluate each asset categories (Pompian, 2012;p.171). R. Thaler (1985) first coined the term in a model development on consumer behaviour. Baker, Kumar, Goyal, et al. (2019) found the presence of mental accounting bias among individual investors in Indian context. Individual investors, in South Africa were found to be affected by mental accounting bias (Dickason & Ferreira, 2018). Agnew (2006) found the presence of mental accounting bias among U.S. employees using their 401(k)-plan data. Individual investors' financial decision making process is significantly impacted by mental accounting bias in India (Chandani et al., 2020). Mental accounting bias is found to have a significant association with disposition effect (Zahera & Bansal, 2019).

Rationale of the Study

In the last decade there have been several review studies conducted on the theme of behavioural finance and investment decision making. Costa et al. (2019) conducted a bibliometric analysis of the scientific fields of behavioural economics and behavioural finance. Jain et al. (2021) conducted a systematic review of the impact major behavioural biases on investment decision making and investment performance of individual investors including 'risk perception' and 'gender' effects on investment decision making. Ingale and Paluri (2020) conducted a bibliometric review on the effect of financial literacy on financial behaviour. Costa et al. (2017) conducted a bibliometric analysis on the effect of anchoring, overconfidence and confirmation bias on investment decision making within the theme of behavioural finance. Nigam et al. (2018) conducted a meta-analysis on the mediators of financial decision making. Grežo (2020) conducted a meta-analytic review on the effect of overconfidence bias on financial decision making. Kumar and Goyal (2015) conducted a systematic review on the effect of overconfidence, herding, disposition effect and familiarity bias on investment-decision making. There has been no study done on the effect of heuristics driven biases like availability, mental accounting, and representativeness biases on investment decision-making. Therefore, this study tries to fill this gap by conducting a bibliometric analysis on the aforesaid scientific field.

Research Questions

The present article tries to focus on the following research questions.

(i) Which are the most influential sources and who are the most influential authors in the aforesaid scientific file of study?
(ii) What is the intellectual structure of the aforesaid scientific field of study?
(iii) What is the state-of-the art research collaboration in the said scientific field of study?
(iv) How did the scientific field evolve over time and what are the key research agenda?

Descriptive and network analysis are used to investigate the aforesaid research objectives. The rest of the paper is structured as follows: the next section describes the methodology. The fourth section describes the data analysis portion. The fifth section describes the findings of the data analysis. The sixth and the last section contains the conclusion of the present study and comments on for future research agenda.

3. Methodology

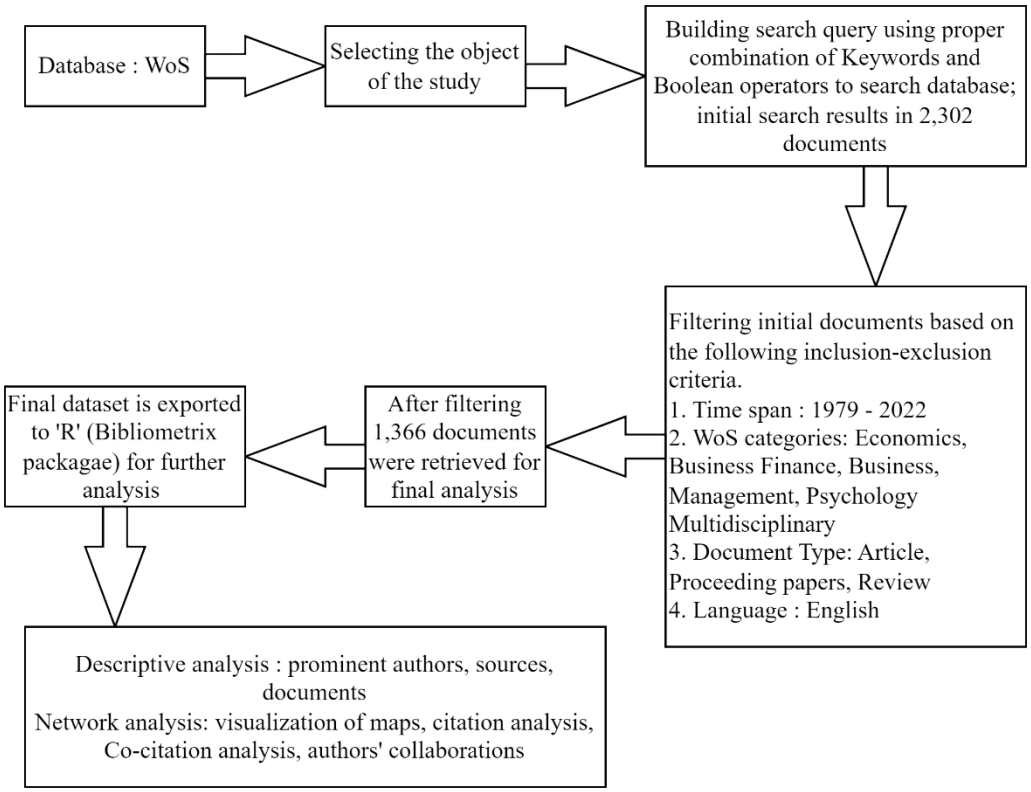
Bibliometric analysis must be based on primary studies and should be reproducible (Greenhalgh, 1997). Based on quantitative technique bibliometric analysis is useful to unearth important aspects of the state-of-the-art in a scientific field of study, such as the citations, co-citations, authors, co-authors, most frequently used keywords, authors social network, evolution of the field etc. (Sánchez-Riofrío et al., 2015; do Prado et al., 2016; Costa et al., 2017).

In essence bibliometric studies are essentially to analyse quantitatively the nature of production, dissemination of the output and the use of recorded information of a selected scientific field (Tague-Sutcliffe, 1992). Trends of publication related to emerging fields of research and the evolution of the scientific field over the time are also important aspects of a bibliometric study (Liu et al., 2014). Thus bibliometric study is regarded, within the context of social sciences (Carlson & Ji, 2011), as an important methodology to assess the scientific output of an academic field of study (Liu et al., 2014).

The bibliometric analysis of this study starts with the selection of a database. Keywords separated by Boolean operator are used to retrieve documents. Then, these documents are filtered by inclusion and exclusion criteria resulting in final dataset. Bibliometric analysis is done on this final dataset. First, descriptive analysis

of the retrieved documents is performed to know the most prominent sources, authors, documents etc. This is followed by network analysis of maps created to highlight the conceptual, intellectual, and social structures of the chosen scientific field (Figure 1). This study is conducted according to the following stages which are based on the study of (Fahimnia et al., 2015) on green supply chain management.

Figure 1: Process flow diagram of the bibliometric analysis



3.1. Bibliographic Database Selection

Clarivate analytics' Web of Science (WoS) database is selected for retrieval of the manuscripts needed for this study. Web of Science is the leading database of indexed top tier journals and it excludes non-academic documents like magazine articles and non-scientific journals (Rodríguez-Ruiz et al., 2019). Its Journal Citation Report (JCR) is widely regarded among academician worldwide (Liu et al., 2014; Costa et al., 2017).

3.2. Data Extraction for Analysis

Data were downloaded from WoS in plaintext format on 9th November, 2022 in order to comply with the compatibility of the Bibliometrix package in R software. Documents were extracted following the following steps.

3.2.1. Keywords used in the search query

Keywords were selected based on extensive literature review to extract relevant documents. "Availability bias," "mental accounting" and "representativeness" are the terms used for the cognitive biases. "investment decisions", "investors' investment decision", "investors' decision-making", "investment decision-making", "financial decision-making", "investor behaviour", "investor behaviour" are the terms found in the literature relevant to investment decisions. "Behavioural finance" or "behavioural finance" were used to delimit the

search within the paradigm of behavioural finance. Appropriate Boolean operators (AND, OR) were used to separate the keywords. The keyword search was conducted on titles, abstract, author keywords, keywords plus on the Web of Science database. The search was restricted to documents indexed in SCI-Expanded, SSCI, A and HCI, CPCI-SSH, BKCI-SSH and ESCI. The resulting search query looks like: TS = ("availability bias" OR "mental accounting" OR "representativeness") AND TS = ("investment decision*" OR investors' investment decision" OR "investors' decision*" OR "financial decision-making" OR "investor behaviour") AND TS= "behavioral_finance." This initial search resulted a total of 2,302 documents comprising all the subject categories.

3.2.2. Inclusion / Exclusion criteria

Subject categories: Economics, Business Finance, Business, Management and Psychology Multidisciplinary were selected as the appropriate subject categories and this resulted 1,452 total number of documents.

Article type: Journal articles, conference proceedings and review papers were selected for this analysis.

Selection of time span: Aforesaid documents starting from 1979 till 2022 were selected for this analysis. 1979 was selected as the starting year because of the development of the Prospect theory (Kahneman & Tversky, 1979).

Language selection: Documents written in English were selected only for this analysis.

Final dataset: After applying the aforesaid inclusion / exclusion criteria the final dataset contained 1,366 documents and further analysis was performed on these documents.

3.3. Bibliometric Analysis Tool Selection

Bibliometric analysis was originally used in the field of library and information science for the enhancement of efficiency and effectiveness (Tella & Aisha Olabooye, 2014). Nowadays bibliometric analysis is widely used in other scientific fields too. It is gaining importance day by day particularly because of the fragmented nature of the existing knowledge base which makes science mapping a complex task (Aria & Cuccurullo, 2017). This study uses Bibliomterix, a package in R and developed by (Aria & Cuccurullo, 2017). Bibliometrix uses a predefined automated workflow to integrate various functionalities of bibliometric analysis. Further, since it is written in R language it facilitates integration with other statistical packages available in R and easily upgradable.

4. Data Analysis and Results

Bibliometric analysis is performed on the extracted dataset in two stages; descriptive and network analysis.

(i) Descriptive analysis is comprised of finding basic structure of the retrieved bibliographic data, like 1) sources, 2) documents and 3) authors.
(ii) Network analysis is composed of different statistical techniques applied on the maps produced to find 1) conceptual, 2) intellectual and 3) authors' collaboration or social structures of the bibliographic data.

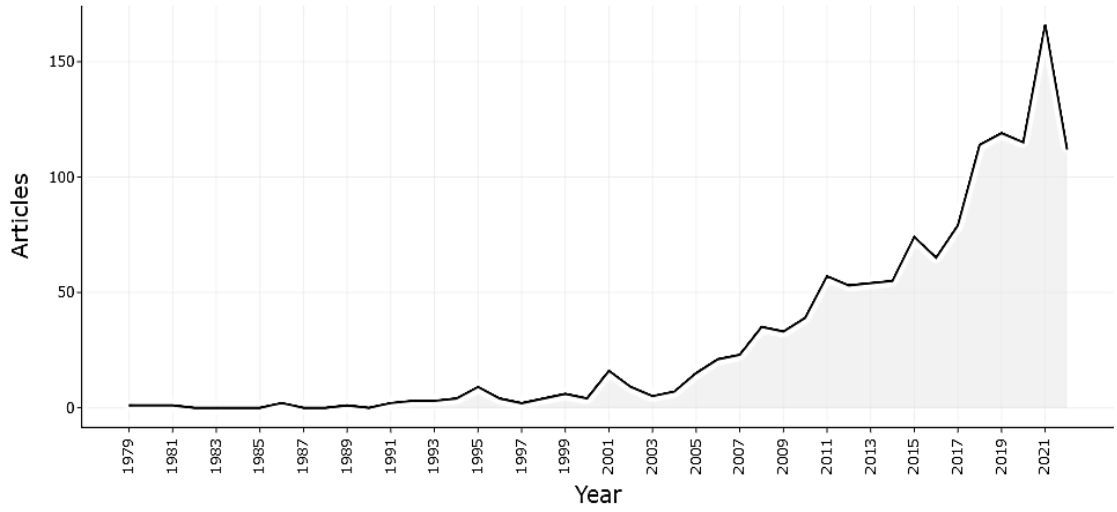
4.1. Descriptive Analysis

This section describes the following dimensions of the dataset obtained through descriptive analysis.

4.1.1. Sources

The average scientific production in the domain is found to be 11.6 % which is a substantial rate of growth. (Figure 2) shows the scientific production over the selected timespan and 2004 onwards the scientific production increased exponentially till 2021.

Figure 2: Scientific production over the years



The top twenty (20) most relevant sources are shown in (Figure 3). These shows in which journals majority of the documents are published in the context of the aforesaid research domain. Journal of Economic Psychology with 39 publications stood first. Journal of Marketing Research with 29 published documents stood second and Frontiers in Psychology with 24 publications stood third. (Figure 4) indicates the top 20 most impactful sources in the bibliographic collection. The impact of a particular source is measured in terms of h-index which indicates the impact and productivity a particular source has. H-index is measured by assigning a maximum integer value “n” to a journal such that it publishes at least “n” articles and each of these articles has been cited in at least “n” other sources.

Figure 3: Top 20 most relevant sources

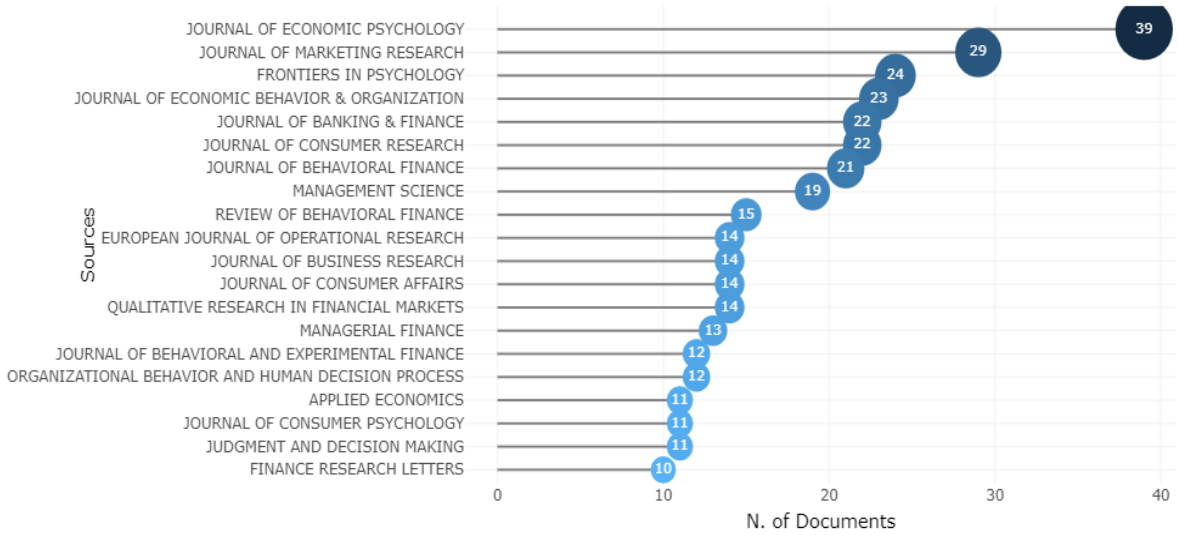
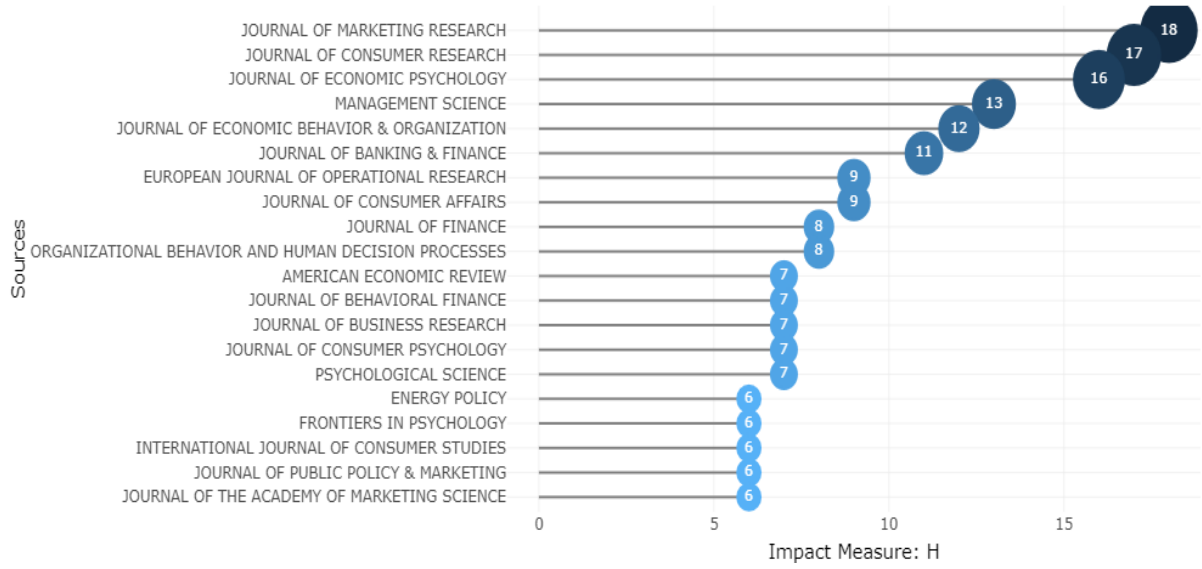


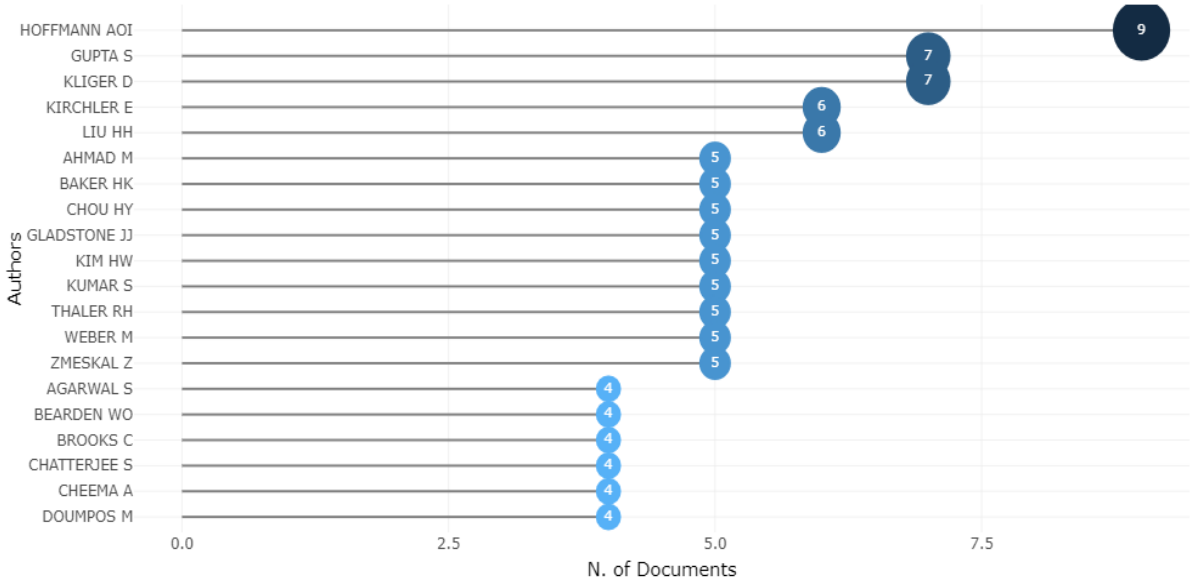
Figure 4: Top 20 most impactful sources based on h-index



4.1.2. Authors

Top twenty most relevant authors in the scientific domain are shown in (Figure 5). Hoffmann AOI, Gupta S, Kliger D, Kirchler E and Liu HH are the top five relevant authors in decreasing order of published documents.

Figure 5. Most relevant authors



4.1.3. Most prominent countries

Top ten most productive countries in the scientific domain are shown in (Table 1.). The USA, China and the UK are the top three countries in terms of the greatest number of research publications in the selected timespan. India occupies rank 4 in the list with 126 publications. Top ten most cited (local citations) countries are shown in (Table 1). The most locally cited countries in the scientific field are the developed economies. India occupies 9th rank in the top ten most cited countries list.

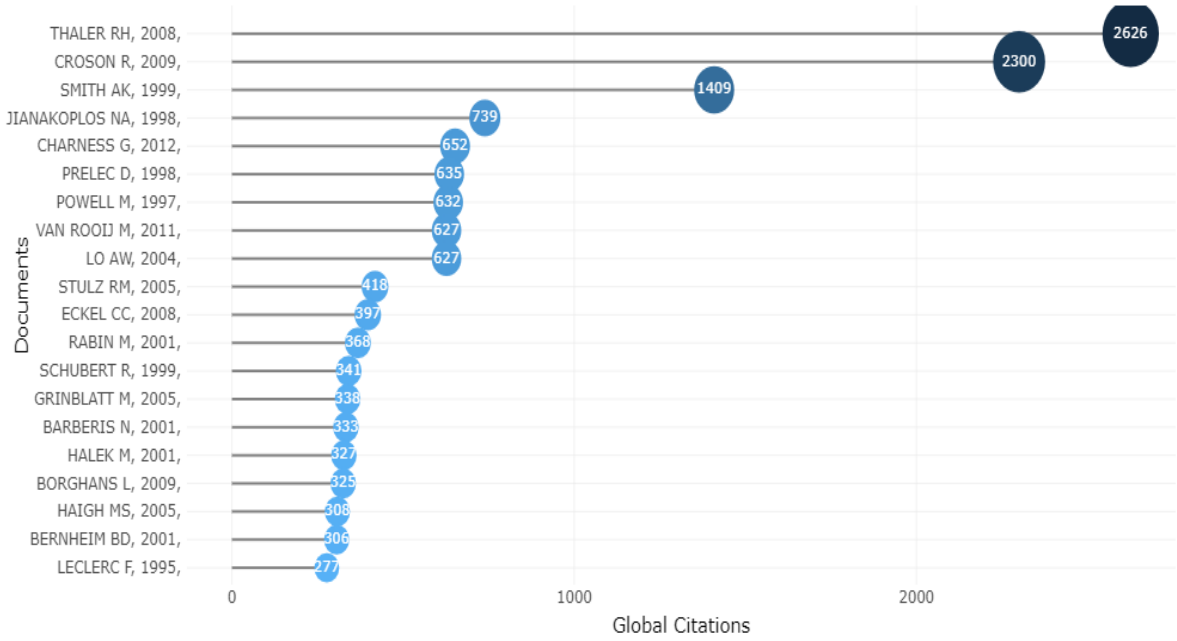
Table 1: Most productive and most cited countries

Country-wise production			**Most cited countries**	
Country	**Frequency**		**Country**	**Total citations**
USA	873		USA	22792
CHINA	297		UK	2148
UK	197		CHINA	1402
GERMANY	129		GERMANY	1214
INDIA	126		NETHERLANDS	777
AUSTRALIA	98		AUSTRALIA	530
PAKISTAN	77		CANADA	495
NETHERLANDS	71		FRANCE	454
FRANCE	64		INDIA	378
CANADA	62		PAKISTAN	126

4.1.4. Documents

Figure 6 represents the top 20 most cited documents in the scientific domain. The paper on mental accounting (R. H. Thaler, 2008) is the most cited paper in the list because it was the seminal paper that described the role of mental accounting in consumer decision making process.

Figure 6: Most cited documents



4.1.5. Keywords

Figure 7 represents the most frequently used author keywords in the bibliographic data sample. The authors' keywords cloud is produced by selecting 50 keywords provided by the authors. "Behavioral finance" with 74 occurrences, "financial decision-making" with 59 occurrences, "decision making" with 55 occurrences and "prospect theory" with 39 keywords are the most frequently used keywords in the scientific domain. Further, "financial literacy" with 65 occurrences is the other most frequently used keyword in the list. It shows that there is considerable research and publication within the theme of "financial literacy" and "financial decision-making" in the context of behavioural finance. Other related research themes are "credit card," "debt," "savings," "retirement" etc. Research interest on "mental accounting" grows exponentially post year 2000, whereas, research interest in "prospect theory" and "financial decision-making" found an exponential rise in the last decade and it has not reached its maturity.

Figure 7: Authors' keywords cloud.

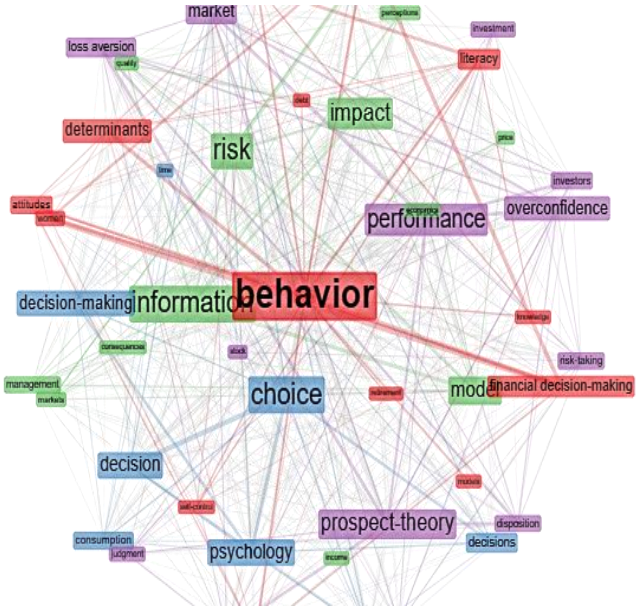
4.2. Data Visualization

Visualization of bibliographic data refers to quantitatively assess the bibliographic data using statistical methods through creation of clusters, their relatedness, number of occurrences of each item of analysis and total citation count of each item (Low & Siegel, 2020). Visualization involves creation of maps based on bibliographic network coupling among the bibliographic data frame. Two articles are said to be bibliographically coupled if the two articles use at least one common cited reference. Bibliographic coupling networks are created by "biblioNetwork" function in the R-bibliometrix package. Bibliographic coupling network uses different unit of bibliographic data such as authors, sources, keywords, affiliation etc. and networks are represented by nodes with different colours and links among them (Aria & Cuccurullo, 2017). Through network analysis three types of knowledge structures are generated, namely, conceptual, intellectual, and social.

4.2.1. Conceptual structure

Conceptual structure is the only part of network analysis that incorporates information on the content of research papers. It derives its unit of analysis from the commonly used keywords among the research papers. Conceptual structure disseminates which keywords are related in terms of research themes (Li et al., 2018). Since keywords are the unit of analysis this is often called co-word analysis. Figure 8 shows the Co-occurrence network of 50 "Keyword-plus" found in the bibliographic data frame. Four different clusters with red, green, blue, and violet colours emerge from the figure. Behaviour is positioned at the centre of this structure indicating its relatedness with all others nodes. The size of the node "behaviour" is also the largest indicating it is the key theme in the research papers. Red coloured cluster is dominated by behaviour and financial decision-making. Green coloured cluster is dominated by information, risk, and impact. Information and behaviour are very close to each other indicating considerable research output on these areas. Blue coloured cluster is dominated by decision-making, decision, choice, psychology. Violet coloured cluster is dominated by performance, prospect-theory, and overconfidence. Knowledge, education, literacy, financial decision-making are related terms found in the red coloured cluster, this means that financial knowledge or literacy or education and financial decision-making is also important research theme.

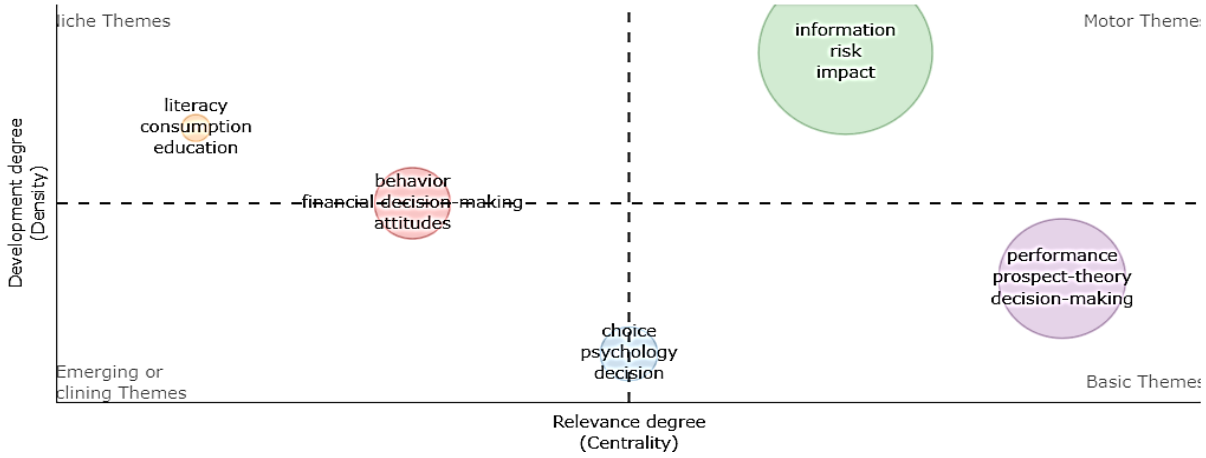
Figure 8: Co-occurrence network



4.2.2. Thematic map

It is a two-dimensional plot of typological themes (Cobo et al., 2011). Based on the co-occurrence network clusters are plotted on a two-dimensional map based on the density and centrality of each cluster. Figure 9 represents the thematic map obtained from the 100 "Keyword-plus" used in the data set. It shows four quadrants. The upper right-hand quadrant consists of information, risk, impact as theme and this area of research is highly relevant to the present analysis and is well developed too. Lower right-hand quadrant has performance, prospect-theory, and decision-making as theme and though it is very important theme in the context of the scientific domain of analysis but it is still in its nascence and there is ample room for further research. Behaviour, financial decision-making, and attitudes are found at the intersection of top left-hand and lower left-hand quadrants. It means that this area of research has somewhat less relevance in the context of this analysis and there lies rooms for further research in this topic. Upper left-hand quadrant has literacy, consumption, education as research theme. This area is outside the periphery of this analysis and it is a well-developed research area.

Figure 9: Overall thematic map



4.2.3. Thematic evolution

Thematic evolution refers to how the scientific field has evolved over the chosen timespan. Overall research themes are produced by co-word analysis. Next thematic evolution of these themes over two time periods are checked based on the presence of common keywords between a theme from one set and a theme from another set of themes. Relative proximity of two themes over two time periods is called the "thematic nexus" in between the two themes (Chen et al., 2019).

Figure 10: Thematic evolution over 4 time slices.

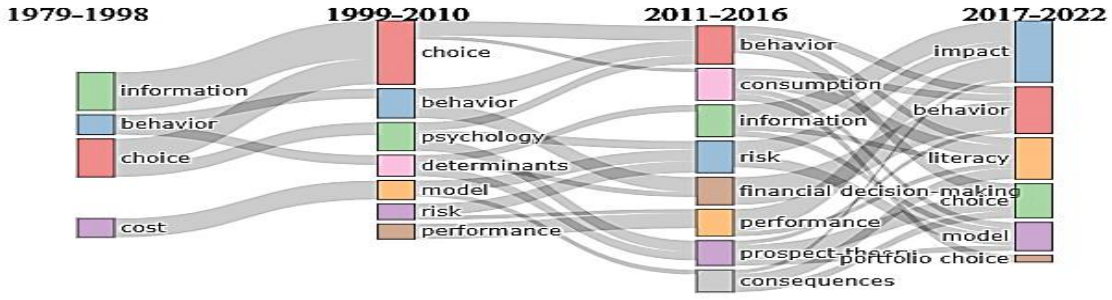


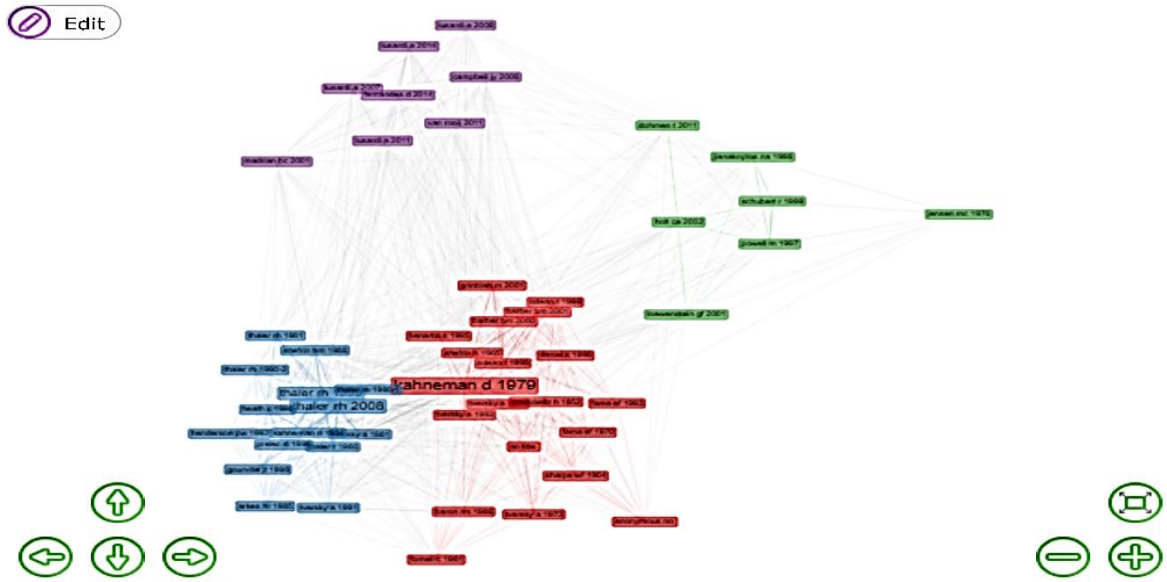
Figure 10 represents the thematic evolution of the scientific domain over the time period 1979-2022 divided into 4 time slices with cutting years 1998, 2010 and 2016. The figure is obtained by selecting 200 "Keywords-plus" and with minimum cluster frequency of 5 out of per 1000 documents. Information, behaviour, and choice represent the major topic areas during 1979-1998. Psychology, choice, decision, and frame are the major research agenda during this period. Research focus gradually shifted towards behaviour, financial decision-making during 1999-2010. Determinants, risk-aversion were also gaining importance during this period. Choice, decision, information, and consumption are related research topic in this period but the areas were not well developed during that period. Whereas, psychology, prospect-theory, decisions, and uncertainty were becoming niche topics during this period and were less developed. Behaviour, choice, decision(s), economics, time were the motor theme during 2010-2016. Risk, return, psychology, model

development, strategies, heuristics were the relevant topic areas during this period but were less developed. Consumption, literacy, retirement, and self-control were the emerging themes during this time period. Attitude, gender differences, aversion, women reached maturity during this time but were not related to the agenda of this analysis. Impact, information, performance, risk, overconfidence were the motor themes during 2017-2022. Behaviour, attitude, financial decision-making, financial literacy, determinants, behaviour were relevant themes but less developed during this period. Portfolio, retirement, heuristics were the niche themes. Again, prospect-theory, choice, decisions, uncertainty, loss aversion, judgement were becoming emerging research themes during this period.

4.3. Intellectual Structure

Intellectual structure of a scientific field helps us to understand the influential studies in the scientific filed and the related research topics in the scientific field (Mendes et al., 2017). Through citation and co-citation analysis intellectual structure is derived (Ingale & Paluri, 2020). Citation analysis is based on the argument that the number of times an article is cited in an academic research paper highlights its relevance and impact. Co-citation analysis reveals how two research papers cite another paper in their references (Mendes et al., 2017; Cobo et al., 2011). The research topic of a research paper can be implicitly found in the cited papers by the research paper. Thus, if two different research papers cite same papers in theirs reference section then it automatically appears that the two research papers are related in terms of the research topic (Liu et al., 2014). Co-citation network analysis can be applied on different units of analysis like papers, authors, and sources. Using paper as the unit of analysis and selecting 50 nodes (papers) and choosing "Louvain" as the clustering algorithm Figure 11 represents the co-citation analysis visualization of the bibliographic dataset used in this study. Four different clusters can be seen in (Figure 11) with four different colours. From cluster 1, shown in red colour, it can be seen that the paper by (Kahneman & Tversky, 1979) is the most important paper and it is quite evident because of the publication of this paper on prospect-theory. After publication of this paper finance academicians started developing the field of behavioural finance. In terms of centrality and betweenness, also, this paper stands out among others in the cluster. Other papers in the cluster related to the concept of utility maximization and rationality are the papers by Harry Markowitz on utility of wealth published in 1952, paper based on judgement under the influence of heuristic driven biases by (Tversky & Kahnem 1974),paper on disposition effect by (Shefrin & Statman, 1985), equity investors behaviour under the disposition effect by (Odean, 1998), theoretical paper on overconfidence, self-attribution bias to explain security market over and under reaction by (Daniel, 1997). In cluster 2 shown in blue colour the paper on mental accounting by (R. H. Thaler, 2008) is the central paper. It is natural because this paper is a conceptual paper on mental accounting heuristic applied by consumers while making economic choices. (R. H. Thaler, 1999) is also based on mental accounting and it is also an important paper. Another important paper on mental accounting in consumer decisions is (R. H. Thaler, 1999). The third cluster shown in green colour highlights papers on gender and risk-aversion. It can be seen from the co-citation network map that important papers on this topic are isolated and far-off from the central theme of this study which is heuristic driven bias and financial / investment decision making. Important papers in this field of research are (Powell, M., & Ansic, 1997), (Schubert et al., 1999), (Jianakoplos & Bernasek, 1998) and (Holt & Laury, 2002). The fourth cluster with green colour shows papers on financial literacy and financial decision making. Although this is an important sub-field of research in the context of behavioural finance and financial decision making but it is out of the present context of this study. Fernandes et al. (2013), Annamaria Lusardi and Mitchell (2011), and A Lusardi and Mitchell (2007) are some important publications on this topic.

Figure 11: Co-citation network based on papers in the bibliographic data



4.4. Social Structure

Interrelationship among different actors such as authors, authors' affiliated institutions and geographical territories reveals the dissemination of knowledge in a scientific field of study (Low & Siegel, 2020). Collaboration networks among different actors like authors, affiliated institutions and countries are a set of nodes connected by links which indicate the co-authorship among authors (Aria & Cuccurullo, 2017). Co-authorship is one of the most important aspect of scientific collaboration which can be effectively tracked by analysing the co-authorship (Glänzel & Schubert, 2004).

Figure 12: Collaboration network among authors' countries

Collaboration network among authors' countries is shown in (Figure 12). It shows U.S.A is the country from where most of the publications have originated. Authors from the U.S.A, Canada, Australia, China, France, and India are grouped together in cluster 1 and authors from these countries have co-authored with each other on common research theme. Whereas in cluster 2 countries like Germany, the U.K., Italy, and the Netherland are prominent in terms of co-authorship in related research domain. Also, authors from these countries have co-authored with authors from the U.S.A on other sub-fields of research.

5. Conclusions

This review paper highlights the evolution of the scientific field of investment decision making and heuristic driven biases within the paradigm of behavioural finance in the timespan of 1979 to 2022. The knowledge structure in this research domain is ascertained through the conceptual, intellectual, and social structure of the relevant documents published in this domain. Bibliometrix, a package in R statistical software, was selected to perform the analysis because of it is an open-source software, it has in built integrated workflow method which makes it user friendly and its wide acceptability among the research community. Web of Science was chosen as the bibliometric database for retrieval of relevant documents because major journal of repute is indexed in it and its compatibility with Bibliometrix package. Scientific production in the aforesaid theme increased exponentially from year 2000. Over the chosen timespan of study, the research theme of this paper has seen 11.6% growth rate annually. Investment behaviour or consumer behaviour or investor / consumer choice, market information, prospect-theory, determinants, consumptions, investment, and literacy are the key terms found in the co-occurrence network. This means the thrust area of research were consumer or individual behaviour or investor behaviour in presence of prospect-theoretic biases. Also, determinants of investor / consumer behaviour were research topics. Investment behaviour and financial literacy within the domain of behavioural finance is another research area of interest among finance academicians. The basic research topics in this chosen theme are prospect-theory and investment decision-making, risk-taking and uncertainty, overconfidence, and market anomalies etc. Moving forward research on investors' attitude toward risk, gender differences in risk aversion, financial decision-making and behavioural biases are gaining active interest among finance researchers and academicians and these topics are still in its nascence and there lies ample scope for further research. Finally, financial literacy or financial knowledge, and investment behaviour is the niche research topic. Based on author's collaboration it can be said that most of the authors in this scientific field are from the developed economies like the U.S.A, Canada, Australia, the U.K., Germany, France, and the Netherland.

6. Limitations and Future Research Suggestions

This study has retrieved primary documents from the Web of Science. Therefore, there could be a chance that few other important relevant papers have been missed out. To resolve this limitation future review papers should use other bibliographic databases like the Scopus, ScienceDirect, and Google Scholar etc. The keywords used in the search query should also be modified to include keywords generated by authors to retrieve more papers relevant to this analysis.

This study employs bibliometric analysis to disseminate the knowledge structure of the present theme of analysis. This analysis is based on different attributes of a paper like author, keyword, source, affiliation, country etc. But this analysis does not involve full-text analysis and research synthesis of the present state-of-the-art in this field. Knowledge synthesis is necessary to have a clear view of the literature on any scientific field. Therefore, systematic literature review in association with bibliometric analysis would give better understanding of the present standing of this field. Meta-analysis of papers relevant to this field with mediation-moderation analysis is necessary to validate the empirical studies in different context. Thematic analysis of this review reveals that the present theme of review includes many sub-themes. Aggregate market-

wise behaviour in the presence of heuristics have been well studied but at the micro level individual investors did not get the required attention of researchers. Therefore, ample research scope is there in this theme considering individual investors. Moreover, individual investors from different professions and how their investment behaviours are impacted by the presence of heuristic driven biases are important research agendas. Although, there are papers on retirement, savings and financial decision making, these are fragmented. To further extend the knowledge and develop the literature in this scientific field more researches are required. Innovative research topic on emerging asset classes like crypto currency within the present theme is also another important area for future research. Finally, it is seen that financial literacy and investment behaviour is emerging topic. How financial literacy or knowledge mediate the investment behaviour under the presence of heuristic driven biases could be future research topic. Gender difference in financial decision-making and the role of heuristic driven bias is also an important future research agenda.

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