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EXPLORING THE EVOLUTION OF FINANCIAL LITERACY AND INVESTMENT: A BIBLIOMETRIC ANALYSIS OF THE PAST DECADES' ACADEMIC LITERATURE

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Abstract

Purpose: *Several exploratory, conceptual, and empirical studies on investing behaviour and financial literacy have been undertaken in economics, finance, psychology, business, and management. However, no attempt has been undertaken thus far to offer a full scientific mapping of the area. As a result, the study attempts to elicit the tendency in the scientific sector via the synthesising of information structures.*

Design & Methodology*: A bibliometric study of 420 papers in the area on financial literacy as well as investments research was conducted using a scientific search method ran on the scopus database from 2002 to 2022. The study made use of Biblioshiny, a web-based application contained in the Bibliometrix package written in R (Ariaa and Cuccurullo, 2017). Using the software's automated process, notable journals, authors, nations, articles, and topics were discovered, and citation, co-citation, and social network analyses were performed.*

Findings: *The findings indicate that the topics of financial literacy with investment have grown through time as a multidisciplinary discipline. In addition to the conceptual structure, the present study discloses the domain's intellectual and social structure. This study sheds light on issues that require additional exploration.*

Research Limitations*: Because the current study is a bibliometric analysis, the limitations associated with such studies apply. A comprehensive study of the literature might be beneficial for future scholars in developing a robust conceptual framework. The Scopus database was used for this study because it has a greater coverage of high-quality publications in structured forms that are compatible with the Bibliometrix programme. The quality and extent of the current literature limit the scope of the review. The methodology and populations analysed in the papers that make up the review differ, limiting the ability to be generalised of the findings.*

Practical Implications*: The current study sheds light on financial literacy, investments, and their interrelationships. It emphasises the most addressed challenges in the field and points to potential study opportunities. It educates future scholars about emerging topics, settings, and cooperation opportunities in this field by showing the domain's social and intellectual structure.*

Social Implications*: The review has important social implications, as investment has significant implications for individual and societal welfare. Improving financial literacy and investment behavior can enhance financial well-being, reduce inequality, and promote economic growth.*

Originality/Value*: This study gives a detailed summary of existing financial literacy and investment information on global Level. The study synthesises a wide range of studies, finds similar patterns, and offers insights into the variables influencing investing behaviour.*

Keywords: *Financial literacy, investment, financial education, financial advisors, automated investment platforms.*

***Paper Type**: Literature review.*

1. INTRODUCTION

In today's complicated and fast changing economic scene, financial literacy and investing research are growing increasingly crucial. Individuals, homes, and organisations must be able to make educated financial decisions in order to accomplish their financial objectives and successfully manage financial risks. Furthermore, solid investment research is required for investors to make educated investment selections and optimise their investment portfolios. As a result, knowledge of finance and investment studies has attracted a lot of attention in recent years from academics, policymakers, and practitioners. Financial literacy is described according to the Organisation for Economic Cooperation and Development (OECD) as "the awareness and comprehension of financial ideas and products, as well as the capacity to apply this understanding in order to make intelligent decisions" (OECD, 2020). Financial literacy has a significant impact on financial behaviour and outcomes such as savings, repayment of debt, and retirement planning. Numerous studies, however, have found that financial literacy levels in the general public are low, which can contribute to poor financial decisions and unfavourable financial consequences (Lusardi and Mitchell, 2014; van Rooij et al., 2011). The examination and assessment of investment possibilities, risks, and returns, on the other hand, is referred to as investment research. Investors with personal financial advisors, and institutional investors such as banking institutions, mutual fund companies, and pension funds can do investment research. A thorough grasp of the financial markets, securities, & economic fundamentals is required for sound investing research. Yet the quality and dependability of investing research can vary greatly, resulting in wildly disparate investments suggestions and outcomes. A growing body of work has used bibliometric evaluation to identify major research themes, knowledge shortages, and emerging trends in order to more fully comprehend the growth of knowledge about finances and investment research. Bibliometric assessment is a quantitative tool that maps the conceptual framework of a study topic using citation & publication data (Van Eck & Waltman, 2017). Bibliometric analysis may uncover the most prominent authors, organisations, and publications, in addition to the most significant research issues and knowledge gaps, by analysing patterns of co-citation, bibliographic coupling, or social networks. In this study, we give a bibliographic review of academic papers on financial literacy & investment research during the last decade. Our research will look for important research subjects, knowledge shortages, and current developments in this discipline. This study's findings may be valuable to lawmakers, instructors, and professionals interested in enhancing knowledge about finances and results from investments.

1.1 Financial Literacy & Investment

Financial Literacy

Financial literacy has become a popular study issue in recent years, with scientists looking at many elements of the topic, such as its drivers, repercussions, and solutions. Several studies have found that financial literacy is related to better financial outcomes, such as greater savings rates, more diverse portfolios, and better managing debt (Lusardi and Mitchell, 2014; Robb and Woodyard, 2011). Furthermore, financial literacy was linked to improved general health and happiness in life (Drentea and Lavrakas, 2000). Various variables of financial literacy have been found via research, including demographic characteristics like gender, age, level of education, income, & ethnicity. Women and people with lower levels of education and income, for example, have lower levels of financial literacy, according to research (Lusardi and Mitchell, 2014; Hilgert et al., 2003). Aside from demographic characteristics, psychological and behavioural components which include financial beliefs, risk perception, and self-control have been identified as major predictors of financial literate (Hastings et al., 2013). A potential strategy to promote financial literacy has been proposed: financial education. Several research on the impact of financial education programmes upon financial literacy and behaviour have shown conflicting results. Financial education has been shown in certain research to promote financial literacy and behaviour (Fernandes et al., 2014), but not in others (Collins et al., 2016). Furthermore, several research have revealed that the efficacy of financial awareness programmes may be affected by aspects such as programme scheduling, delivery, and content (Mandell and Klein, 2009).

Investments

Investment research is an important step in the investing decision-making process. Investment suggestions and outcomes can be influenced by the quality and dependability of investment research. Several studies have been conducted to assess the accuracy and use of investment studies, with conflicting findings. According to certain studies, investing research is biassed, incomplete, and out of date (Korkeamaki & Smythe, 2012; Bollen & Bushee, 2001). Other studies have concluded that investing research, particularly for individual investors, may be helpful and valuable (Barber and Odean, 2008). Several criteria, including the analyst's skill, the declaration of independence, & conflicts of interest, have been identified as predictors regarding investment research quality (Bhojraj and Lee, 2002). Furthermore, business factors such as number, industry, & financial performance might have an impact on the quality and dependability for research on investments (Mikhail et al., 1999).

Financial literacy and investing behaviour are two interconnected issues that have gotten a lot of focus in the finance literature. Financial literacy is referred to as the capacity to comprehend and efficiently use financial information in order to make informed judgements (Lusardi & Mitchell, 2014), whereas investment behaviour refers to the activities that individuals perform in relation to their investment decisions. Several research have found a link between financial literacy and investment behaviour. Individuals with greater levels of financial literacy, for example, possess more diversified investment portfolios, invest more in equities, and perform better in the stock market (Lusardi & Mitchell, 2014; Grable et al., 2011). Furthermore, financial literacy was linked to increased investment optimism & tolerance for risk (Hastings et al., 2013). Several elements, however, have been recognised as impediments to optimal investing behaviour. Behavioural biases like overconfidence, fear of loss, and herding behaviour are examples of these characteristics (Barber & Odean, 2008), as are demographics variables such as gender, educational attainment, and age (Hilgert et al., 2003). A possible intervention to increase investing behaviour has been proposed: financial education. Several research on the efficacy of financial education programmes on investment behaviour have shown conflicting results. Financial education has been shown in certain research to increase investing behaviour and achievement (Fernandes et al., 2014), but not in others (Collins et al., 2016). Furthermore, several research have revealed that the efficacy of financial literacy may be affected by aspects such as programme scheduling, delivery, and content (Mandell and Klein, 2009). Other interventions, such as the employment of financial advisers, automated investing platforms, and financial incentives, have been recommended to enhance investment behaviour in addition to financial education (Choi et al., 2014). However, the efficacy of these treatments in promoting investing behaviour has not been well investigated. Financial literacy & investing behaviour are important subjects in finance research, with several studies suggesting a positive relationship between the two. However, other factors, including behavioural biases & demographic features, may operate as obstacles to optimum investing behaviour. Financial education and other interventions to promote investment behaviour are being proposed, but more research is needed to identify effective approaches to encourage better investment outcomes.

1.2 **Bibliometric Analysis**

Bibliometric analysis refers to a method of quantitative investigation that entails analysing and assessing bibliographic data in order to acquire insights into the features, patterns, and trends of a certain field of study.

Finding Research Patterns: Bibliometric analysis enables academics to study the evolution of research on a certain topic across time. It assists in identifying new trends, major themes, and the most prominent authors or publications in financial literacy and investing behaviour (Chen, 2017).

Mapping Knowledge Structure: Researchers can generate visual representations of a field's intellectual structure by analysing bibliographic data. This aids in comprehending the connections between various ideas, subtopics, and research fields in the investigation of financial literacy & investing behaviour (Zupic & ater, 2015).

Bibliometric analysis allows academics to evaluate research production by examining the quantity of publications, citations, plus partnerships among scholars. It aids in the identification of the most productive investigators and organisations in the area, offering insights into total research production regarding financial literacy and investing behaviour (Rafols et al., 2012).

Discovering Research Gap: Bibliometric analysis can indicate sections of the literature that are under-researched or have gaps. Researchers can help bridge gaps in knowledge regarding financial literacy and investing behaviour through discovering areas that have gotten less attention (Chen, 2017).

Monitoring Research Impact: By evaluating citation patterns and assessing their effect within the academic community, bibliometric analysis allows scholars to estimate the impact of publications. Researchers may identify significant studies and follow the transmission and effect of research results upon financial literacy and investing behaviour using this technique (Bornmann et al., 2017).

1.3 Research Questions:

1. Who are the most significant financial literacy and investment publications and authors?
2. What is the research community's intellectual structure?
3. What exactly are the collaboration networks in the financial literacy & investment fields?
4. How has the notion of financial literacy & investments evolved, and what are the most recent challenges addressed?

1.4 Research Objectives

1. To identify trends or patterns in the growth of knowledge in the areas of financial literacy and investment.
2. To explore the knowledge structure to produce knowledge synthesis

2. RESEARCH METHODOLOGY

The selection of the database for this study is followed by data collecting according to the search technique. (Fig 1)

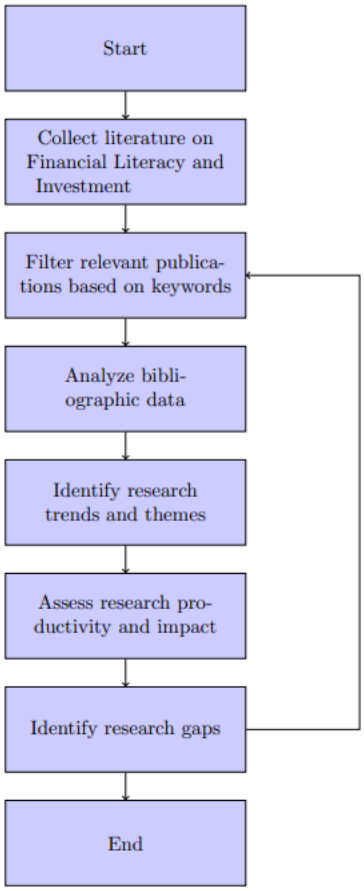

Figure 1: Flowchart illustrating bibliometric analysis on Financial Literacy and Investment Behavior.

After finding and selecting an acceptable source, data for this investigation were retrieved. database (see Figure 1). This followed by a search query employing the appropriate combination of numerous key terms. After the data set has been produced using the relevant inclusion and exclusion criteria, It is assessed using software tools to determine exclusion criteria. At first, a descriptive analysis of the data is performed in terms of sources of information, documents, and authors. The data was subsequently reduced using techniques like principal component evaluation and multiple correspondence analyses. Following this, network maps were created to improve data visualisation by showing conceptual, intellectual, and social aspects of the data (Ariaa & Cuccurullo, 2017). The article is comparable to Fahimnia et al. (2015)'s work on green supply chain management, which was done in phases.

2.1 Selection of Database

"Scopus was chosen as a repository used in our bibliometric analysis for a number of reasons." To begin, Scopus provides broad coverage of academic literature in a variety of areas, including science, technology, health, the social sciences, & humanities (Scopus Content Coverage Guide, 2021). Its comprehensive indexing comprises an extensive number of academic journals, conferences papers, books, even patents, enabling a thorough examination of the research outputs (Scopus, n.d.). Furthermore, the interdisciplinary character of Scopus makes it particularly appropriate for our investigation, which attempts to investigate the junction of many subjects. Scopus, according to Elsevier, includes several fields and allows for an extensive approach to research analytics (Elsevier, n.d.). This interdisciplinary coverage broadens the study's relevance and usefulness by capturing a larger viewpoint on the issue.

2.2 Preparing data for analysis

Data were downloaded from Scopus database in CSV format by appling following criteria on 8th May 2023.
TITLE-ABS-KEY ("financial literacy" AND "investment") AND (LIMIT-TO (SUBJAREA , "ECON") OR LIMIT-TO (SUBJAREA , "BUSI") OR LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "PSYC")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English"))
Keywords: “Financial Literacy” AND “Investment”

Subject Categories: Economics Econometrics & Finance, Business Management & Accounting, Social Science and Psychology.
Document types : Articles
Languages: English
Timespan: 2002-2023

2.3 Selection of Bibliometric tool

The study used a bibliometric approach for comprehensive science mapping. It is a time-honored research technique of statistical and quantitative evaluation of scientific literature used in information science and libraries to improve effectiveness and efficiency (Tella & Olabooye, 2014) of the libraries. This work employs the R-package(Bibliometrixs) created in R by Ariaa and Cuccurullo (2017). This programme enables extensive bibliometric research, including analysis of data and display. As previously stated, most bibliometric analyses are complicated because to access constraints caused by commercial licences of these programmes and need substantial training of researchers. Bibliometrix, on the opposite hand, is open-source software developed for thorough scientific mapping analysis. It can be continuously upgraded and integrated with other scientific R programmes. As a result, it is well appreciated by users and is becoming increasingly important in the ever-evolving field for bibliometric analysis, for descriptive as well as and network analysis. The data in this study was processed using Biblioshiny, a web-based tool included in the Bibliometrix package.

3. DATA ANALYSIS & FINDINGS

The data was organised into descriptive analysis & scientific mapping.

1) Descriptive analysis examines bibliometric information in terms of fundamental data set properties such as (1) sources/journals. (3) documents and (2) Authors
2) Scientific mapping uses visualisation to undertake substantial science mapping approaches such as network analysis, three field plots, and thematic maps, and develops knowledge structures to aid in future analysis (Fig 2)

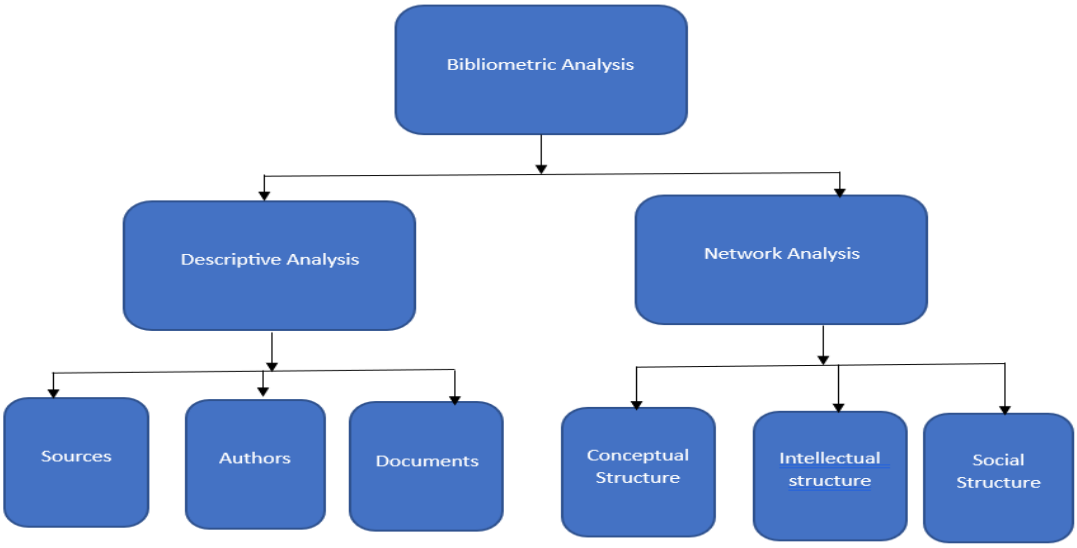

Figure 2 showing Data analysis

3.1 Descriptive analysis

Descriptive Analysis will discuss the following analysis:

3.1.1 Data Set

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	2002:2023
Sources (Journals, Books, etc)	260
Documents	420
Annual Growth Rate %	18.61

Document Average Age	4.22
Average citations per doc	19.29
References	18451
DOCUMENT CONTENTS	
Keywords Plus (ID)	383
Author's Keywords (DE)	1098
AUTHORS	
Authors	987
Authors of single-authored docs	67
AUTHORS COLLABORATION	
Single-authored docs	71
Co-Authors per Doc	2.62
International co-authorships %	20
DOCUMENT TYPES	
Article	420

The data set spans the years 2002 to 2023, reflecting the time frame during which the articles were gathered. This information aids comprehension of the analysis's time span. Publications from 260 various sources, including as books, journals, and other publications, are included in the data collection. This demonstrates the breadth of the material evaluated for the study and reflects a comprehensive covering of relevant sources. The data collection contains 420 documents that reflect the various units of analysis. These materials might be research papers, papers from conferences, or other intellectual outputs. The yearly increase of 18.61% suggests the quantity of documents has increased significantly over time. This growth rate indicates a considerable expansion in the subject of research or study of interest within the time period under consideration. The average age of 4.22 indicates that the documents in the data collection have been published relatively recently on average. This information gives an idea of how recent the literature under consideration is. Average number of citations per document: It demonstrates the importance and impact of the articles in the data set, with an average level 19.29 citation per document. Higher numbers of citations may indicate that the study has had an impact on the scientific community. There are a total of 18,451 references referenced within the documents in the data collection. This data represents the amount to which the analysed articles build on prior research and gives insights into the field's intellectual basis. The existence of 383 Keywords Plus shows that extra relevant phrases were identified in addition to the author-assigned keywords. Those additional keywords would have been collected using specialised approaches to capture crucial topics that the authors did not explicitly disclose. Keywords used by the author in 1,098 author-assigned keywords indicates the precise areas of emphasis or themes discussed in the texts under consideration. These keywords give information about the writers' major research subjects and interests. There are 987 distinct authors in the data set that made contributions to the analysed articles. This data displays the total number of researchers active in the area and offers an overview of the research community's collaboration network. Single-authored papers in 420 documents, 67 were composed by a single author. This shows that the analysed data set contains both single-authored and collaboration outputs. There are 71 single-authored documents in the data set, indicating the contribution of specific writers. Furthermore, each paper has an average number of 2.62 co-authors, demonstrating a tendency to work together within the scholarly community. The proportion of international co-authorships of 20 indicates the extent of international cooperation in the analysed articles. This reflects the level to which scholars from various nations collaborated on scientific initiatives. The total number of articles in the data set is 420, showing that the study focused solely on research papers as the major kind of publishing.

3.1.2 Three field plots

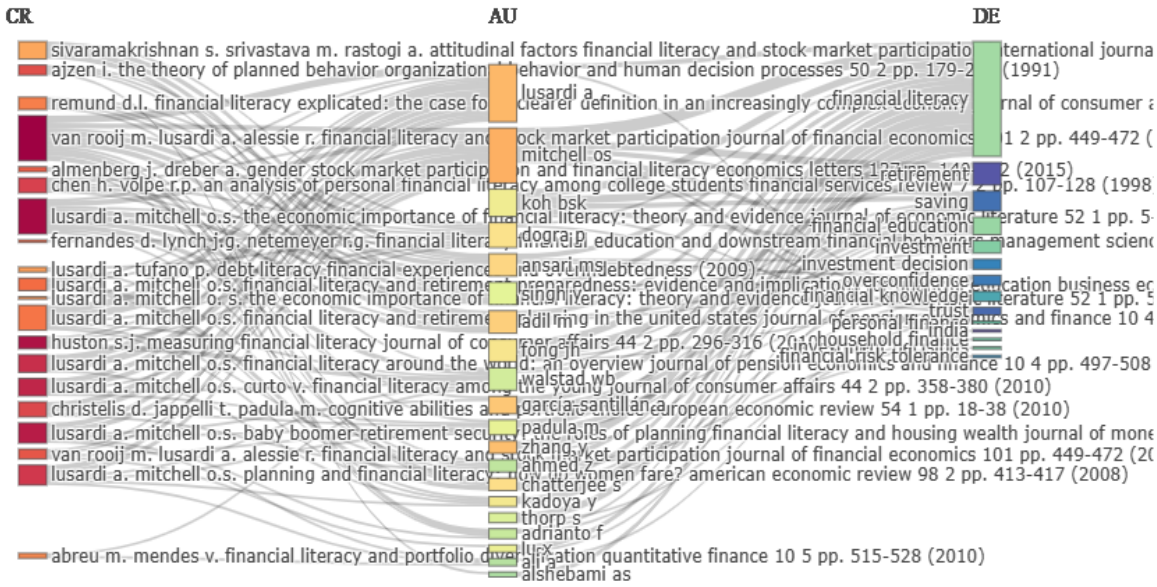

Figure 3 showing Three field plot analysis

Three field plots use Sankey Plots to show the relationship between three fields, with the size of the part corresponding to the value on the node (Riehmann et al., 2005). (Fig 3)The authors are on the left side in the Sankey Plot, the keywords are in the centre row, and the sources chosen for analysis are on the right side. Each item displayed notable terms such as financial literacy, financial behaviour, and financial capacity, as well as their sources and prolific writers. All 10 important publications covered the issue of "financial literacy," demonstrating its critical significance in moulding "financial behaviour."

3.1.3 Sources

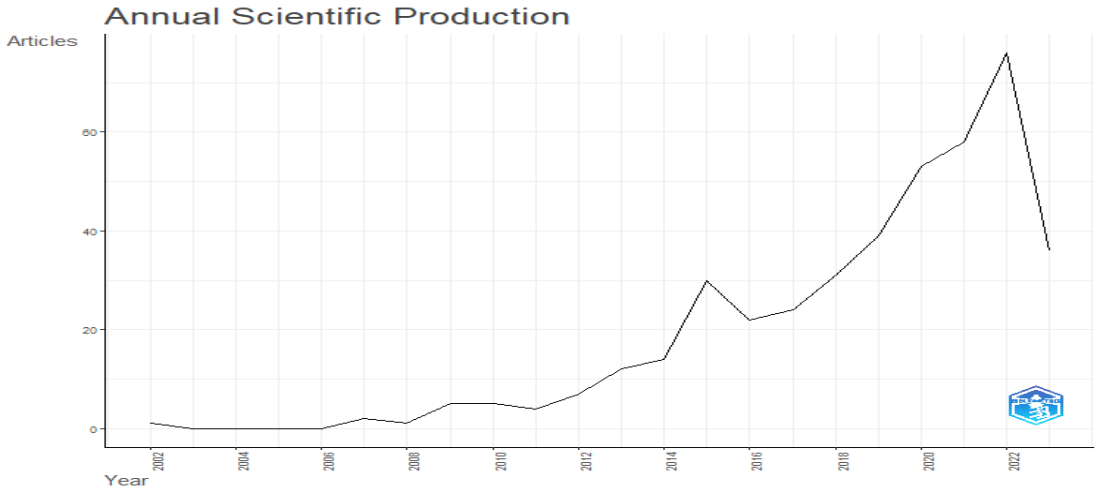

Figure 4 showing Annual Scientific Production

According to data this was a period of little or no item manufacturing between 2003 to 2006(Fig 4). However, there has been a general increasing tendency beginning in 2007, with minor swings. During 2012 to 2015, there was a large growth in article output, followed by rather constant figures in 2016 to 2019. As a result, there was a significant increase in the number of articles created in the years 2020 and 2021. According to the statistics, article output will be lower in 2023 when compared with the previous year(Fig 4).

3.1.4 Average Article Citations Per Year

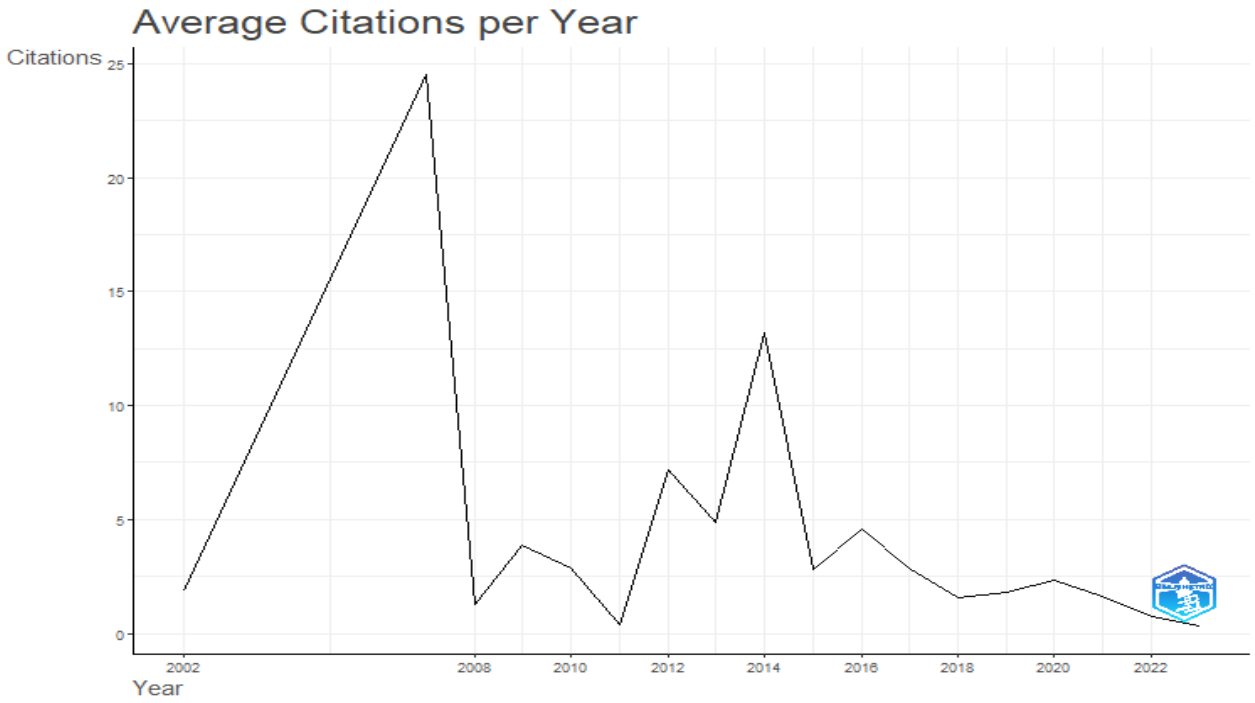

Figure 5 showing Average Citations per year

3.1.5 Most Cited Sources

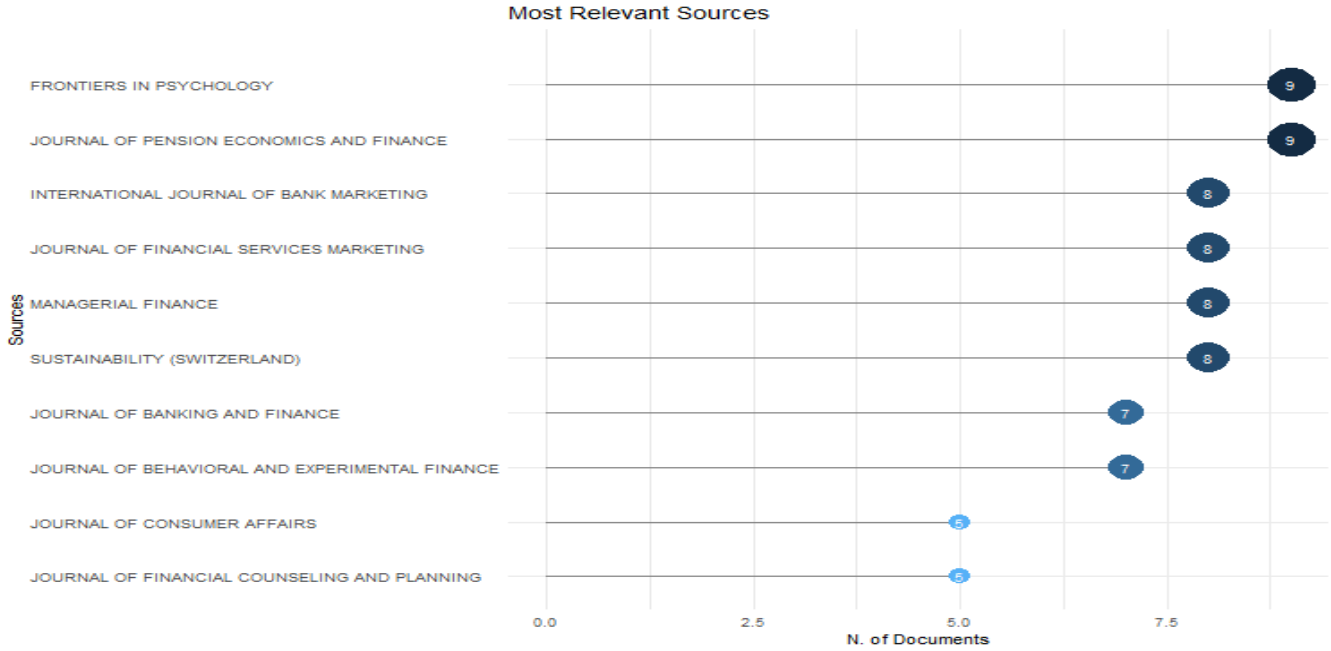

Figure 6 showing Most cited sources

These resources include a variety of research papers from many disciplines, emphasising their relevance and possible effect in their respective domains. These journals can be used by scholars interested in the mentioned fields to find relevant and significant articles(Fig 5 & 6).

3.1.6 Source Growth

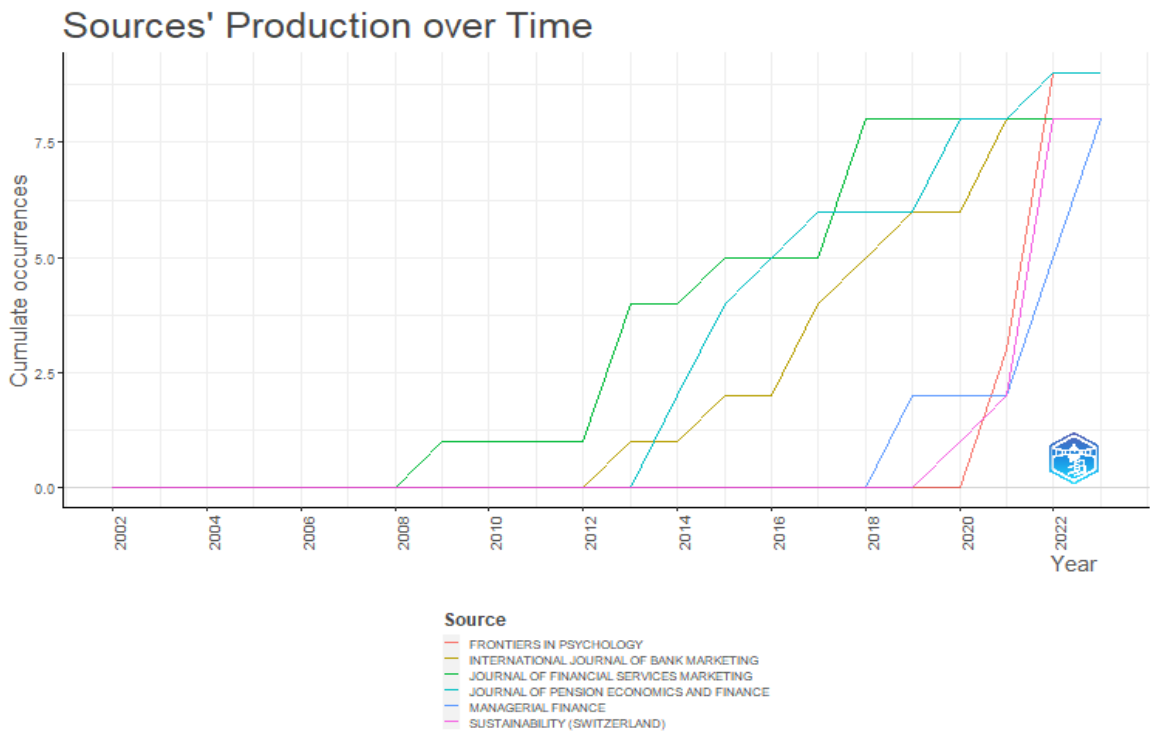

Figure 7 showing Source Production over time

The data supplied depicts the output of papers for different publications over the years. Here's how we perceive the source production & its growth:

Overall, the analysis indicates that FRONTIERS IN PSYCHOLOGY, JOURNAL OF PENSION ECONOMICS AND FINANCE, and INTERNATIONAL JOURNAL OF BANK MARKETING have seen significant increases in article output throughout the years. JOURNAL OF FINANCIAL SERVICES MARKETING and MANAGERIAL FINANCE remained constant, but SUSTAINABILITY (SWITZERLAND) expanded steadily(Fig 7).

3.1.7 Authors

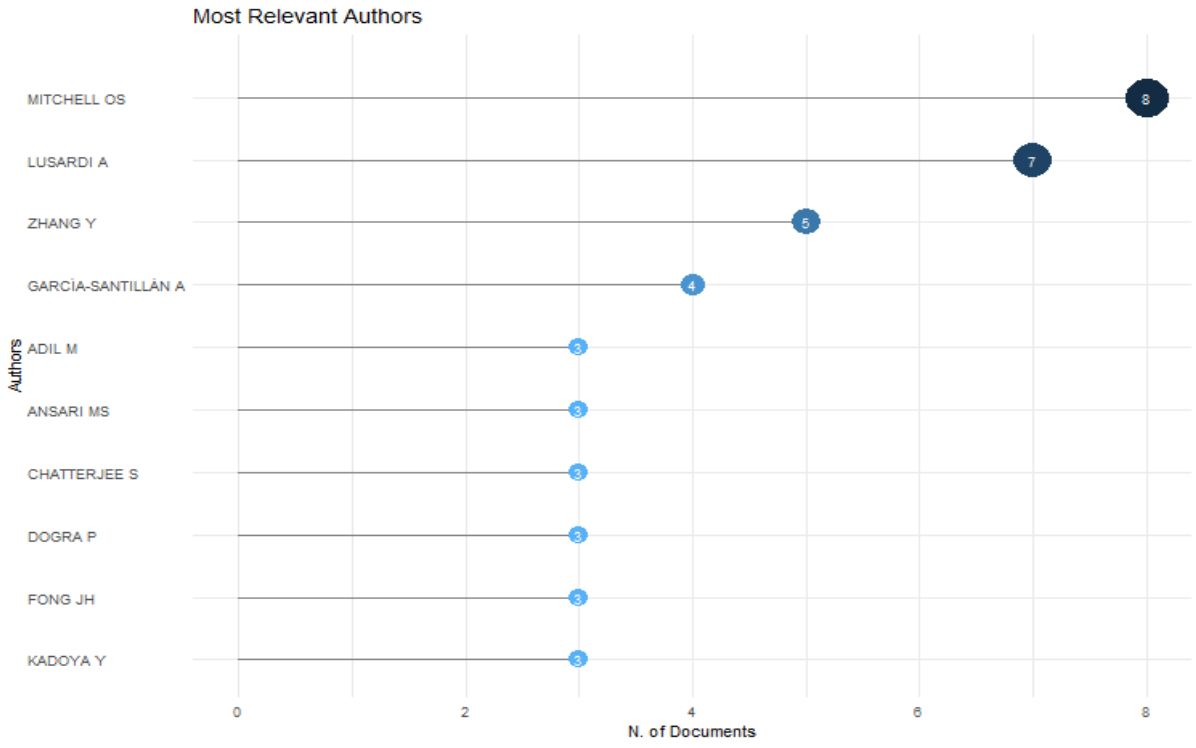

Figure 8 showing Most Relevant Authors

According to the data, Mitchell OS has the author having the most articles, totaling eight. However, when taking into consideration the author's involvement within co-authored publications, Mitchell OS had an average contribution that is around 2.83 papers per publication(Fig 8). Lusardi A comes in second with 7 articles & a fractionalized value that is within 2.58 articles per publishing. Zhang Y has five articles with fractionalized values of 1.37, whereas Garca-Santillán A has four articles with fractionalized values of 1.33. Authors such as Adil M, Ansari MS, Kadoya Y, & Fong JH each contributed three publications. Adil M and Ansari MS have fractionalized values in the 0.87 range, whereas Kadoya Y has a value of 1.17 & Fong JH has a higher value of 1.58. (Fig 8)
Chatterjee S & Dogra P have also published three papers, each having a fractionalized value of around 1.33. It is crucial to remember that without any more information, such as the subject of research or particular relevant criteria, determining the significance or effect of the work of an author is difficult. The fractionalized numbers provide a little insight regarding the authors' contributions as individuals inside co-authored publications, but they do not represent the research's quality, influence, or larger effect(Fig 8).

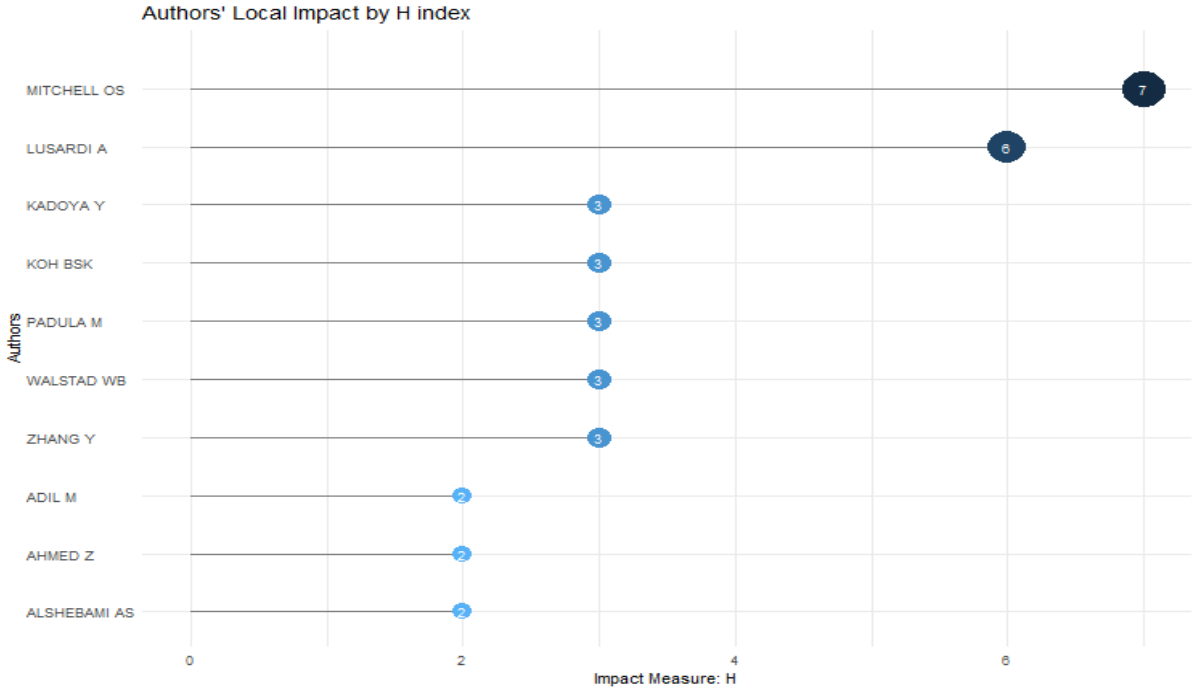

Figure 9 showing Authors Local Impact

The above chart shows (Fig 9) several impact measurements for various writers. Based on the facts provided, below are various interpretations:
Mitchell OS holds an h-index of 7, suggesting that they have produced at least seven publications, each of which has earned seven or more citations. The g-index is 8, implying that their top eight articles have garnered at least 82 = 64 citations. The m-index of 0.7 indicates that their publications have garnered 0.7 citation per year on average since their first publishing. Mitchell OS has 1686 total citations (TC) and has authored 8 publications since 2014.
Lusardi A carries an h-index of 6, suggesting that she has at least six papers with six or more citations. Their g-index is 7, implying that their top seven articles have garnered at least 72 = 49 citations. The m-index of 0.352941176 shows that they have received an average of 0.352 citations every year since their initial publication. Lusardi A has received 2709 citations and has authored 7 publications since 2007.
Kadoya Y possesses an h-index of 3, indicating that she has at least three papers with three or more citations apiece. The g-index also ranks in the three, indicating that their top three articles have gotten at least nine citations. The m-index of 0.5 shows that they have received an average of 0.5 citations each year after their first publication. Kadoya Y has received 52 citations and has authored three papers since 2018.
Zhang Y holds an h-index of 3 as well as a g-index of 5, indicating the existence of at least three articles with three or more citations each, and that their top five articles have garnered at least 52 = 25 citations collectively. The m-index of 0.75 shows that they have received an average of 0.75 citation each year since their initial publication. Zhang Y have a total of 33 citations and has authored 5 papers since 2020.
Adil M has an h-index of 2, suggesting that he has at least two papers with two or more citations. The g-index is also three, indicating that their top three articles have gotten at least nine citations. The m-index of 1 indicates that they have received an average of one citation per year since their first publication. Adil M has a total of ten citations and has authored three publications since 2022.

The remaining writers (Ahmed Z and Alshebami AS) exhibit lower impact measurements, such as lower h-indices, m-indices, and citation counts, suggesting that they have published fewer works or earned less citations than the previous authors.

3.1.8 Countries Scientific Production

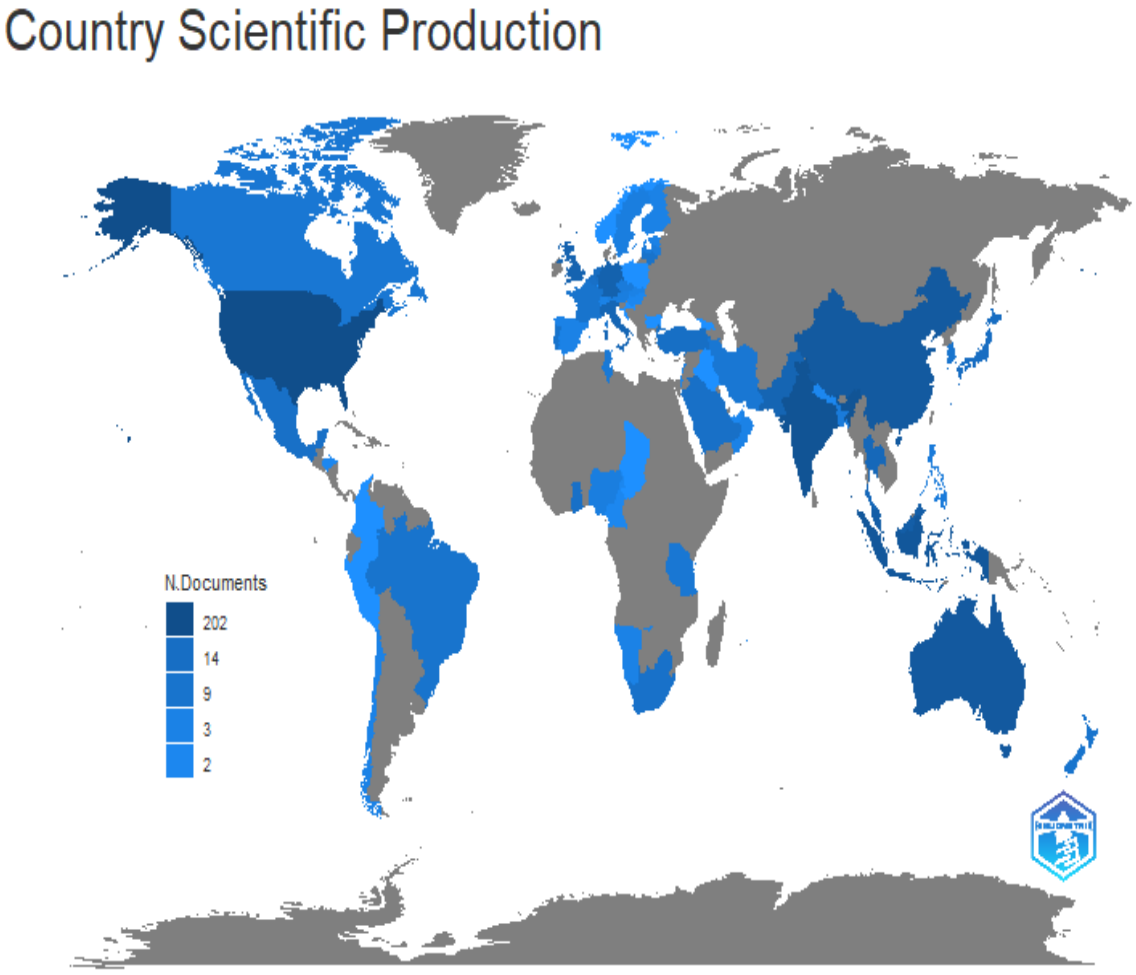

Figure 10 showing Countries Scientific Production

Country	Frequency
USA	202
INDIA	124
INDONESIA	94
AUSTRALIA	79
CHINA	74
MALAYSIA	54
GERMANY	39
UK	34
PAKISTAN	30
ITALY	28

Table Showing Countries Scientific Production

The United States has the greatest level of scientific production (202), next to India (124), Indonesia (94), Australia (79), & China (74) in that order. These nations have active research settings, but others, such as Germany, the United Kingdom, Pakistan, and Italy, have comparably lower scientific productivity, suggesting a lower research output (Fig 10).

3.1.9 Most Cited Countries

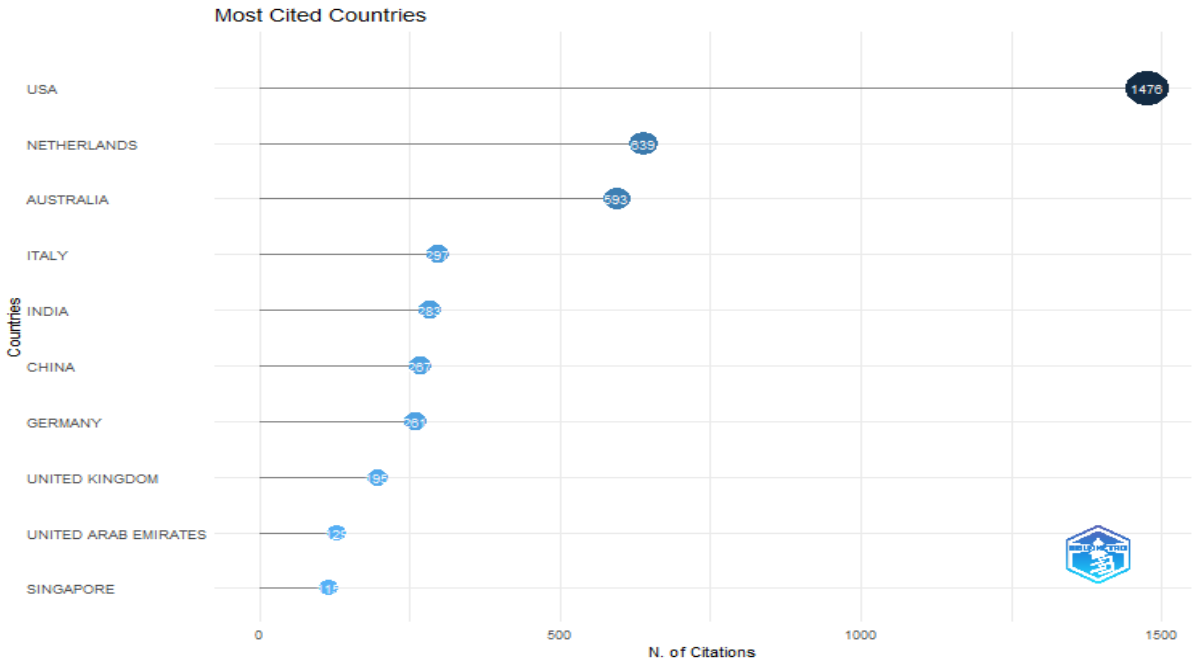

Figure 11 showing Most Cited Countries

The United States is the most referenced country, with 1476 total citations, demonstrating its enormous research influence. The Netherlands gets an impressive average of 127.8 references per publication, showing that its research is important. With overall citation numbers of 593 and 297, respectively, Australia and Italy indicate strong research influence. India, China, as well as Germany also have significant citation numbers, while the UAE and Singapore have high average citations per article (Fig 11).

3.2. Documents :

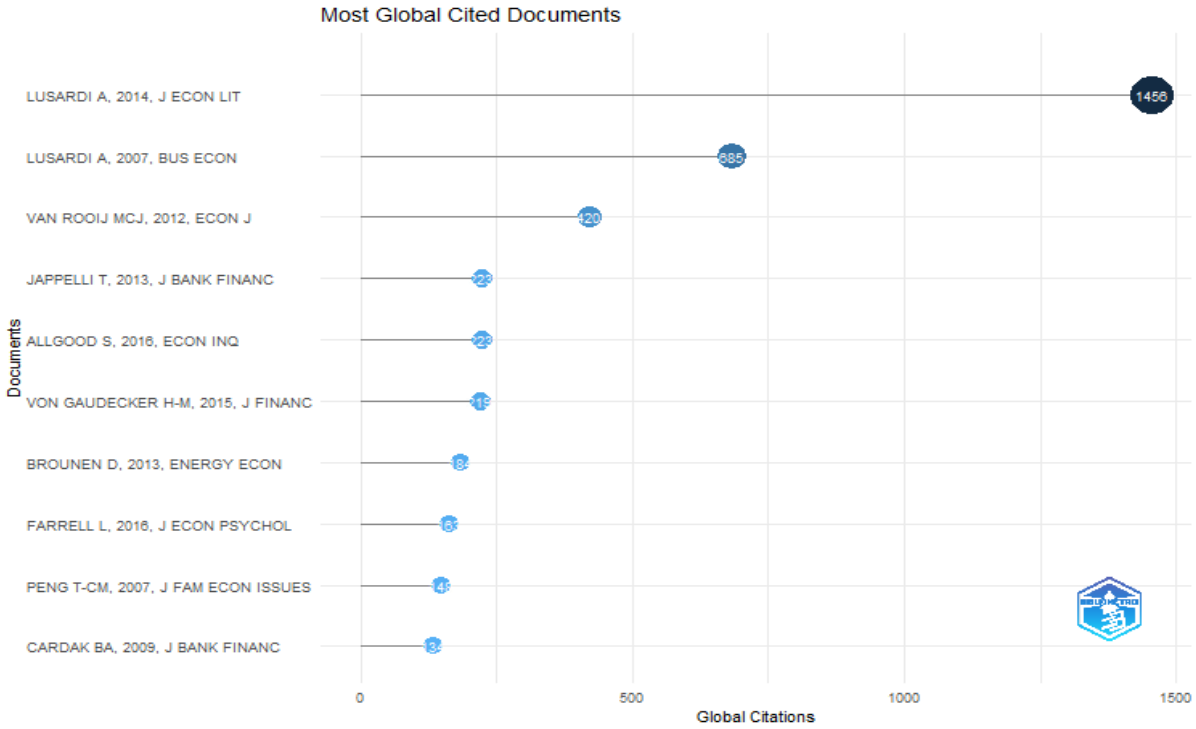

Figure 12 showing Most Cited Global Documents

"LUSARDI A, 2014, J ECON LIT" has received 1456 citations (Fig 12), demonstrating its high effect and influence in the subject of economics. Other articles with high citation counts includes "LUSARDI A, 2007, BUS ECON" having 685 citations, & "VAN ROOIJ

MCJ, 2012, ECON J" had 420 citations, proving their significant contributions to their respective fields of study. (Fig 12)These publications have received a great deal of interest and notoriety within the academic world, demonstrating their significance in driving scholarly debates and giving significant insights.

3.3 Keywords:

The data shown here shows the frequency of specific terms within a particular context. Here are various interpretations according to the keyword frequencies provided: "Investment" appears the most frequently, having a frequency of 34, indicating a strong emphasis on investment-related themes within the context. "Literacy" follows closely behind with a frequency of 25, demonstrating the significance of literacy, especially financial literacy, in the setting under discussion. Both "finance" as well as "financial system" have an average frequency of 12, indicating a significant emphasis on financial issues and the larger financial system. "Investments" & "financial literacy" occur with frequency of 11 and 10, demonstrating their significance and presence in the topic under discussion. Other noteworthy keywords including "education" (7), "human" (7), "decision making" (6), "energy efficiency" (6), "female" (6), & "savings" (6), all of which highlight other themes and issues of interest within the given context (Fig 13 & 14).

Figure 13 showing word cloud

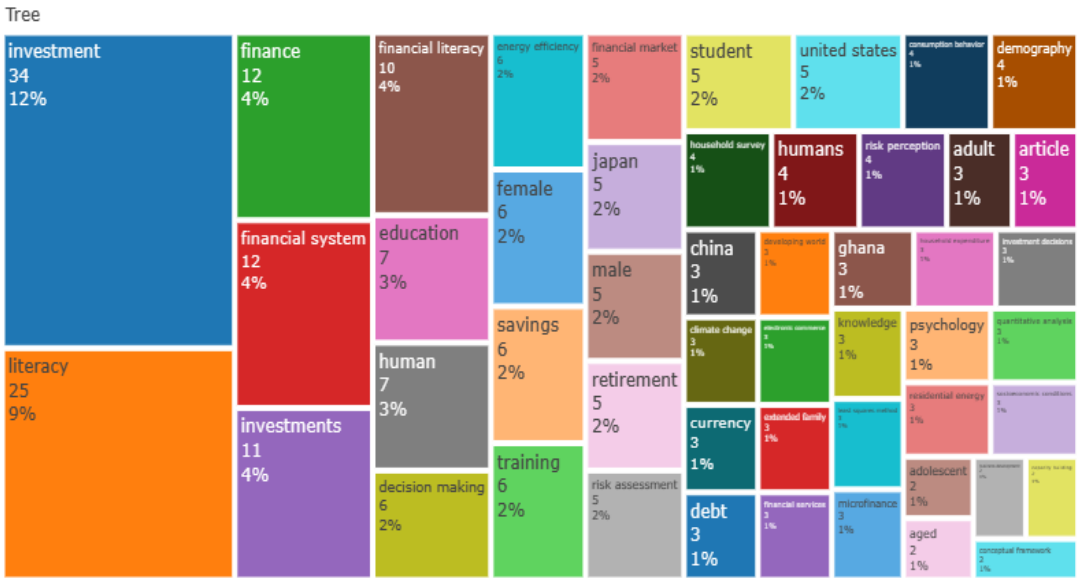

Figure 14 showing word treemap

3.3.1 Trend Topics

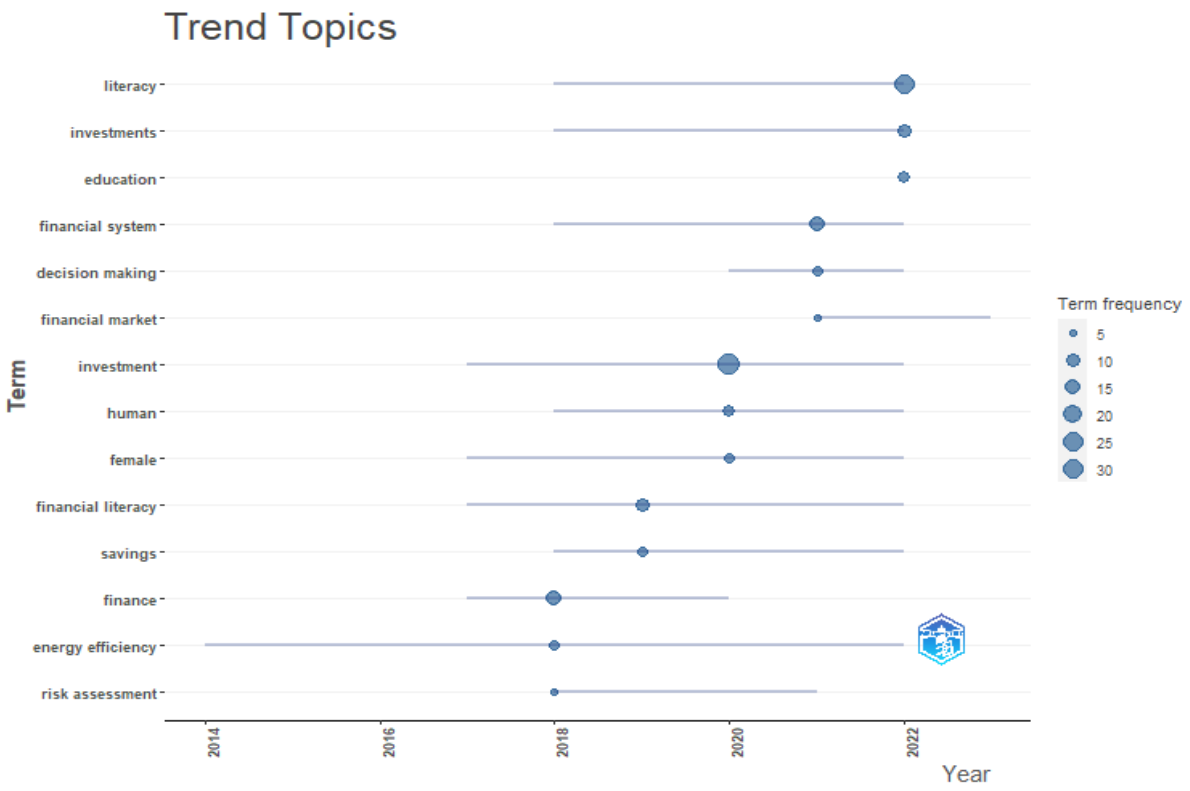

Figure 15 showing trend topics

The data shown here (Fig 15) shows the frequency of particular items (keywords) as well as the year quarters when they were noticed. Based on the statistics, below are various interpretations of popular topics: With frequency of 12 and 12, respectively, "finance" & "financial system" have been continuously popular themes over the years. They demonstrate the ongoing interest and significance of financial systems & its components. "Energy efficiency" has shown a progressive increase in popularity, culminating in 2022 with a frequency of 6. This indicates an increasing emphasis on energy conservation and its significance in the current setting. "Financial literacy" as well as "literacy" also have a significant number of 10 and 25, demonstrating a long-standing interest in financial literacy & general literacy. "Investment" occurs the most frequently (34 times), indicating its popularity as a hot subject during the analysed period. It shows a consistent focus on investment-related conversations. "Human" and "female" had modest frequencies of 7 and 6, indicating continued attention to human-related characteristics and gender-specific concerns within the current context. Both "decision making" & "savings" have a frequency of 6, showing ongoing interest in both issues, with decision-making increasing significance in recent years. "Financial market" & "education" have frequency of 5 and 7, indicating that they are relatively new or developing themes. Overall, the data focuses on current and developing developments in finance, energy savings, risk evaluation, financial literacy, investments, knowledge, and a variety of other areas. These patterns reflect the shifting interests and objectives within the setting under consideration.

3.4 Data Visualisation

Throughout the last few years, the issue on financial literacy & investment has caused increased attention and study focus. This section depicts the field's thematic progression. Data visualisation employs network analysis to quantify the number of clusters that emerge, the frequency of occurrences and relationships across different levels of analysis, overall link strengths, and the number of citations (Low and Siegel, 2019). To extract the networks, multiple methodologies based on various components for analysis including documents, authors, and keywords are used. These networks are made up of nodes that are linked together through connections. It conducts statistical analysis on produced maps to identify various network metrics (Ariaa and Cuccurullo, 2017). The scientific mapping accomplished by network analysis yields three types of knowledge structures: conceptual structure, intellectual structure, and social structure.

3.4.1 Conceptual structure

Using a co-occurrence network analysis(Fig 16), conceptual structure depicts the relationship between themes, subjects, and trends. It is the only strategy that makes use of research paper material. As a result, the unit to be studied is an idea or, more generally, a concept utilised phrases or a common topic discovered in a network (Li et al., 2018). This conceptual framework of the study field is derived by the

Bibliometrix programme using multiple correspondence analysis (MCA). MCA may be used to do numeric and graphical analysis on multivariate nominal data (Greenacre and Blasius, 2006).

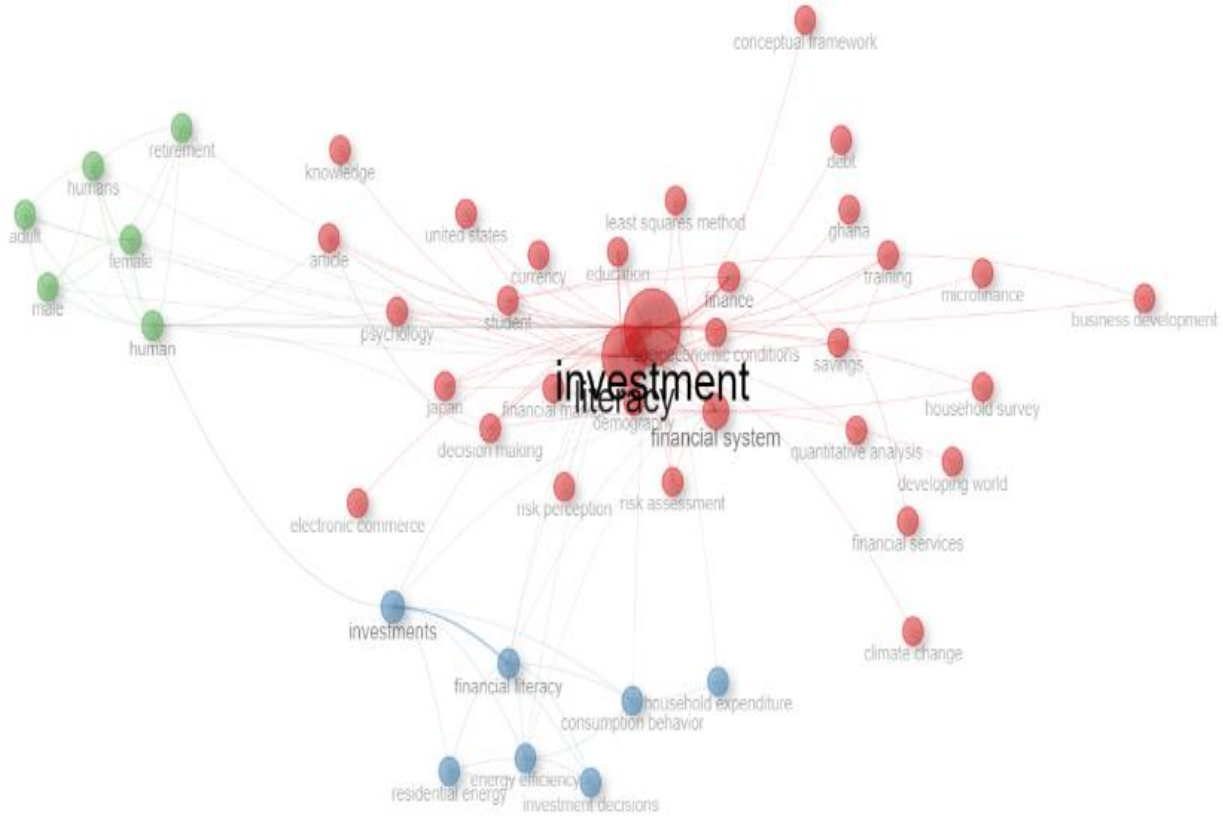

Figure 16 showing Conceptual structure

The co-occurrence map depicts the connections between nodes in a particular dataset. The nodes in this scenario are associated with investing, finance, education, and other related issues. Based on their co-occurrence, the map gives insights into the relationships and associations between these nodes.

Looking at the picture(Fig 16), we can see that Cluster 1 includes investment, literacy, finance, financial system, education, decision making, savings, training, financial market, Japan, risk assessment, student, and United States. The degree to which a node is on the shortest pathways between other nodes is measured by betweenness centrality. Investment has the greatest Betweenness rating in this context, indicating that it is crucial in interconnecting additional nodes throughout the cluster. Literacy and the financial system have quite high Betweenness ratings, demonstrating their importance in linking disparate issues. Closeness centrality quantifies a node's closeness to the other nodes in the group. Investment, literacy, finance, and financial system have the greatest Closeness values in this scenario, indicating that they are more closely related to other nodes in the cluster. The degree to which a node is on the shortest pathways between other nodes is measured by betweenness centrality. Investment has the greatest Betweenness rating in this context, indicating that it is crucial in interconnecting additional nodes throughout the cluster. Literacy and the financial system have quite high Betweenness ratings, demonstrating their importance in linking disparate issues. Closeness centrality quantifies a node's closeness to the other nodes in the group. Investment, literacy, finance, & financial system have the greatest Closeness values in this scenario, indicating that they are more closely related to other nodes in the cluster (Fig 16).

3.4.2 Thematic Map

Thematic maps are two-dimensional plots that depict typological motifs (Cobo et al., 2011). Keyword clusters are generated based on co-word analysis, resulting in themes in the study topic. These themes may be categorised into four quadrants on a two-dimensional graph based on their density & centrality, with centrality and density serving as the two dimensions.

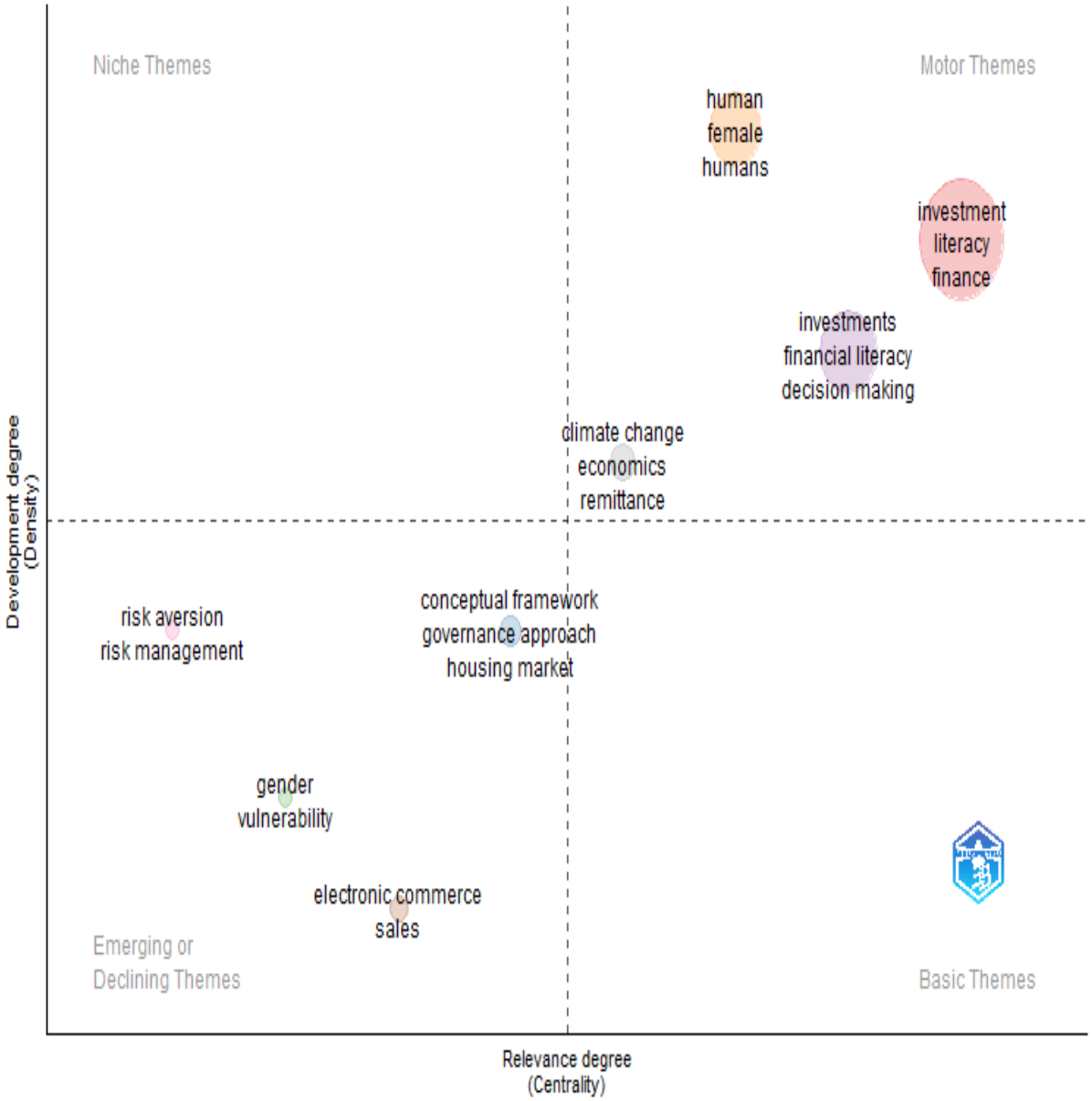

Figure 17 showing Thematic Map

The offered theme map (Fig 17) is a co-occurrence analysis determined by a specific set of criteria and data. Knowing the clusters, centrality measurements, and cluster frequencies is required for map interpretation. Here's a quick explanation:

1. Interpretation of Clusters: Several clusters are identified on the map, including "investment," "conceptual framework," "gender," "investments," "human," "electronic commerce," "risk aversion," and "climate change." Each cluster is a collection of terms that commonly co-occur in the dataset.
2. Centrality Measures: Centrality measures, such as Callon Centrality and Rank Centrality, give information on the significance and prominence of each cluster in the dataset. Higher centrality ratings indicate greater impact or significance. For instance, the "investment" cluster has elevated Callon Centrality and Rank Centrality values, indicating that it is a significant and important cluster within the dataset.
3. Cluster Frequencies: The cluster frequencies show the number of times each cluster appears or is mentioned in the dataset. It indicates the predominance or prominence of a specific theme or issue. For example, the "investment" cluster contains the most occurrences (230), showing that the notion of investment is often addressed in the dataset.

Overall, the thematic map aids in identifying and comprehending the correlations and patterns that exist between various words or concepts in the data collection. It enables researchers and analysts to get insights into co-occurrence trends and the relative value of different groups within the data.

3.4.3 Factorial Analysis

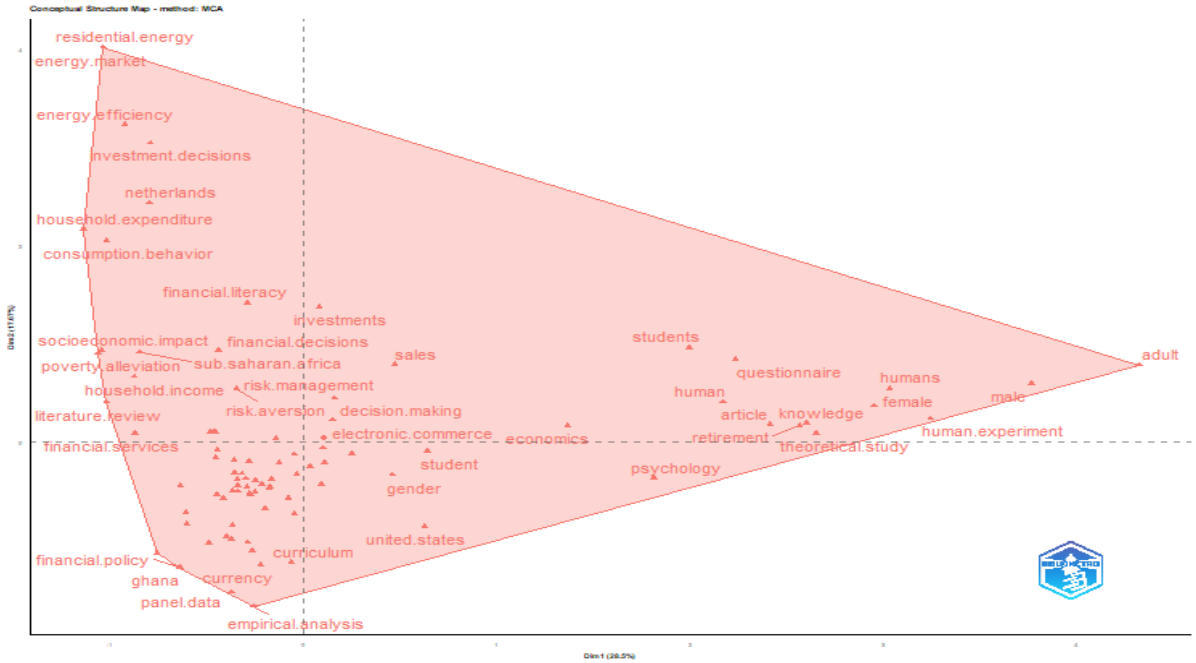

Figure 18 showing Factorial Analysis

The analysis generated two separate dimensions (Dim.1 and Dim.2) & allocated each word to one of two groups. These are interpretations depending on the factorial space coordinates of the words: Financial system, investments, financial literacy, education, savings, training, financial market, Japan, risk assessment: In terms of meaning or context, these phrases are closely related to one another. They are grouped along in the factorial region to emphasise their commonality. Human, choice making, female, male, retirement: all of these words are connected to human elements, decision making, and retirement. Energy efficiency: The term is placed individually in the factorial area to distinguish it from other words. It represents a novel approach to energy efficiency. The factorial analysis identifies clusters & patterns within a given dataset, demonstrating links among words based on co-occurrence and context similarity(Fig 18).

3.5 Intellectual structure

By researching interactions between authors and countries, intellectual structure remarks on how diverse writers affect the scientific community. It displays the extent to which research groups and the research fraternity collaborate, as well as their links with different institutions (Cobo et al., 2011; Mendes et al., 2017). The intellectual structure shown by reference and co-citation analysis exposes several views and schools of thinking that have evolved through time.

Citation Analysis and Co-citation analysis

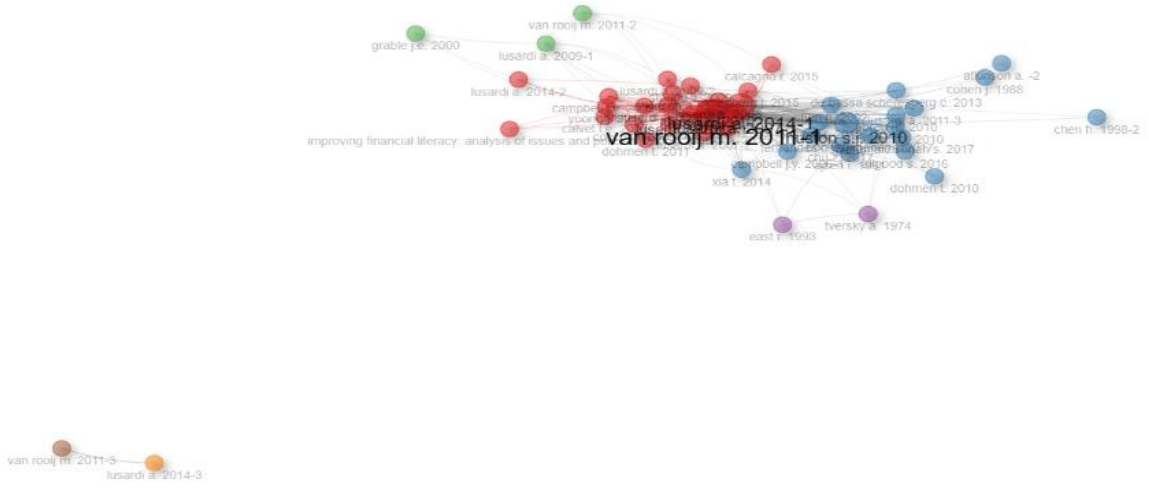

Figure 19 showing Citation & Co-citation analysis

The graph above (Fig 19) looks to be the outcome of citation and co-citation analysis, with information on nodes, clusters, betweenness centrality, closeness centrality, and PageRank included. Based on this data, here are various interpretations:

3.5.1 Analysis of Citations:

High betweenness centrality scores for nodes (Fig 19) such as "van rooij m. 2011-1," "lusardi a. 2014-1," and "lusardi a. 2007-1" indicate that they serve as essential intermediates in the citation network. These nodes are most likely important references in the topic of research. Nodes such as "dohmen t. 2011," "lusardi a. 2009-2," and "stango v. 2009" have lower betweenness centrality ratings, indicating that they have less citation links or are less significant in the network.

3.5.2 Analysis of Co-Citation:

Cluster 1 nodes, such as "lusardi a. 2014-2," "calcagno r. 2015," & "cocco j.f. 2005," have lower betweenness and PageRank scores, suggesting that they are less important or prominent in the co-citation network. Cluster 2 nodes, including "huston s.j. 2010," "ajzen i. 1991," & "fernandes d. 2014," have greater importance in both betweenness and PageRank scores, implying that they play major roles in linking distinct works or concepts within the co-citation network. The nodes "lusardi a. 2014-3," "van rooij m. 2011-3," and "lusardi a. 2009-1" are classified as clusters (5, 6, and 3, respectively) and have high proximity centrality values. This suggests that they are heavily linked inside each of their clusters and are most likely core or significant works inside those clusters.

3.6 Social Network Analysis

Low and Siege (2019) used Social network analysis to elicit connections within the research domain. Nodes represent players such as writers, institutions, or publication sources, and a set of nodes represents the social network's associated relationships. The network dynamics are represented by the links that interconnect these domains(Fig 20 & 21).

3.6.1 Collaboration Network Analysis

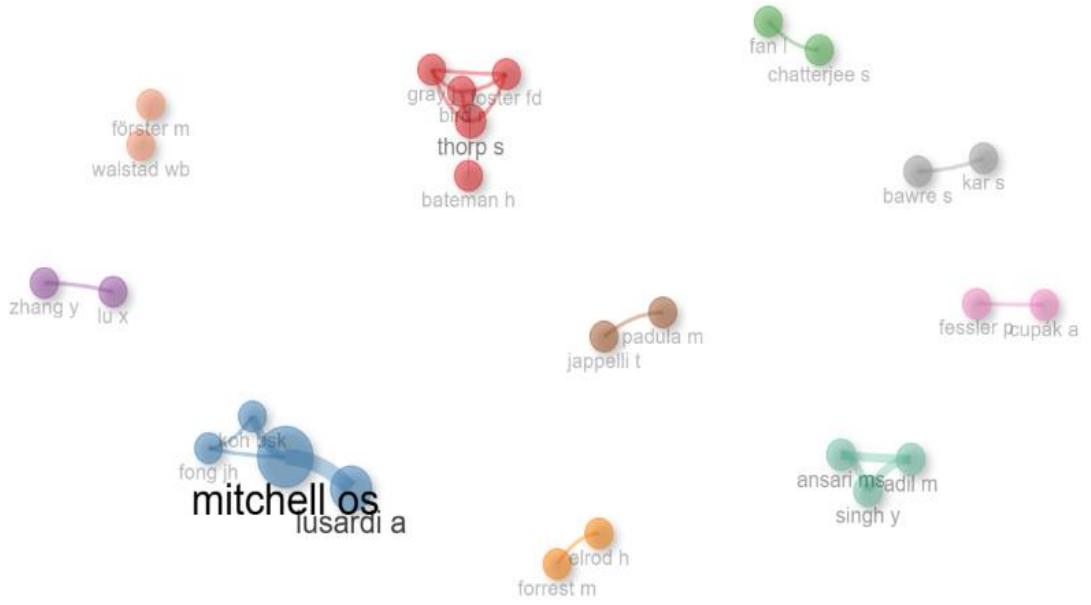

Figure 20 showing Collaboration Network Analysis

Nodes with cluster assignments of 1 and betweenness centrality values of 0 such as "thorp s," "bird r," "foster fd," and "grey j" indicate that they are not central in terms of linking other authors in the cooperation network. Node "mitchell os" is in Cluster 2 and has a considerably higher betweenness centrality score of 2, indicating that this author is more central in linking other authors in the cooperation network. Nodes such as "chatterjee s" (Cluster 3) and "zhang y" (Cluster 4) have cluster assignments of 3 and 4, respectively, and a closeness centrality score of 1, showing that they are well related to other authors in their respective clusters(Fig 20).

3.6.2 Country's Collaboration world Map

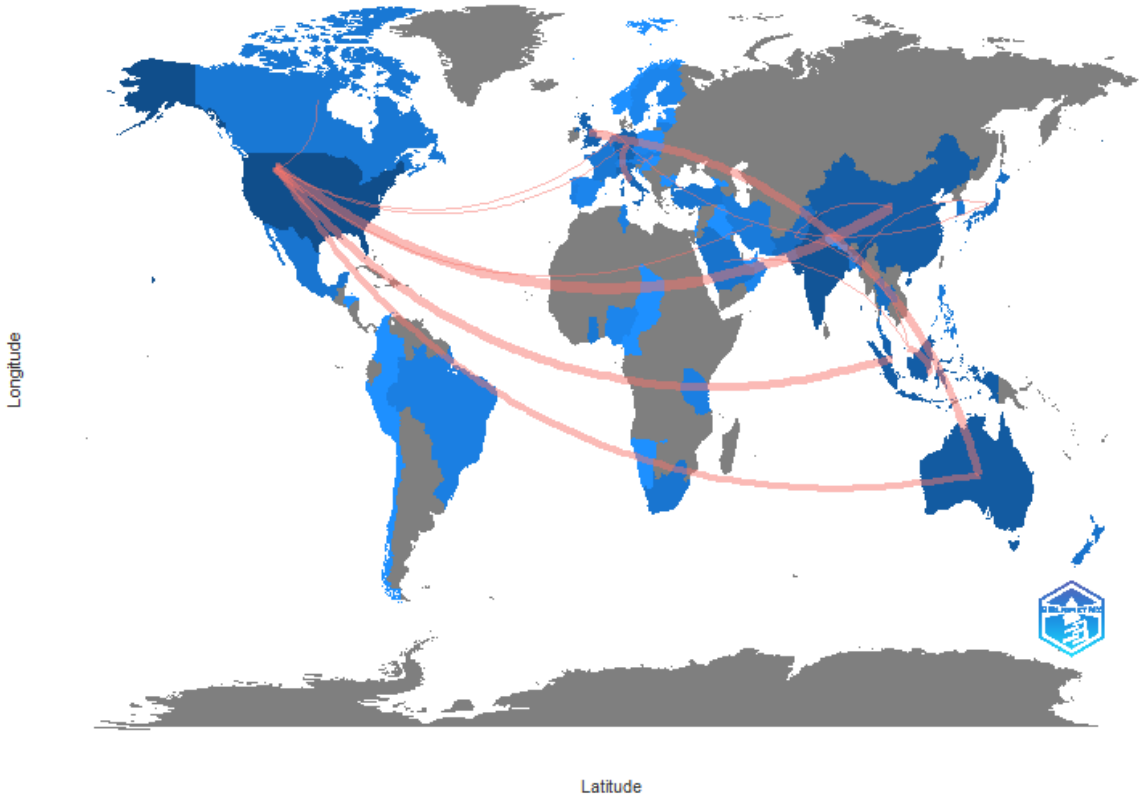

Figure 21 showing Country's Collaboration world Map

(Fig 21)Australia works with China, Ghana, Luxembourg, the Netherlands, New Zealand, Nigeria, Thailand, and the United Kingdom, with the United Kingdom having the most (4 partnerships). Austria works along with Poland and Slovakia. Bangladesh is working with the Philippines. Cameroon is working with Chad. Chile is working with Honduras. China works with Bangladesh, Malaysia, the Netherlands, New Zealand, and Pakistan, with Pakistan having the most collaborations (2 collaborations). Colombia is working with Peru. Germany works with France, Italy, Japan, the Netherlands, New Zealand, South Africa, Switzerland, and the United Kingdom, with Italy having the most (3 partnerships). Ghana works with South Africa. Australia, Bangladesh, China, Malaysia, Oman, Thailand, and the United Kingdom are all partners with India. Indonesia has partnerships with China, Georgia, and Malaysia. Italy works in partnership with Canada, New Zealand, Spain, and Sweden. Japan is working with Bangladesh. Malaysia works in partnership with Georgia, Pakistan, and Saudi Arabia. The Netherlands works with Belgium. Nigeria works with Luxembourg. Pakistan works in partnership with Nepal, Saudi Arabia, and Thailand. Slovakia works along with Poland. Switzerland works with Norway. Thailand is working with Belgium. Turkey works along with Lebanon. The UK works with Ghana, Italy, New Zealand, South Africa, and Thailand. Australia, Austria, Canada, China, Germany, India, Iran, Italy, the Netherlands, the Philippines, Poland, Singapore, Slovakia, Spain, and the United Kingdom work together.

4. CONCLUSIONS

This article examines the progression of the "financial literacy" and "Invesrment" research conduct domains from 2002 to 2023. It also provides a complete examination of the study topic's conceptual intellectual and social structure. The study's major contribution is the synthesis of scattered literature in the subject, identifying notable sources, authors, and documents. Because of its versatility and user friendliness, the Bibliometrix R-package, a tool beneficial for bibliometrics, was employed. Considering its formal framework, quality research sources, and software compatibility, the information set for the study was derived from the scopus database. During 2003 to 2006, article output climbed considerably, with more increases expected in the years 2020 and 2021. In 2023, nonetheless article production will be smaller. The most significant information are the average citations for every year's annual article production, in an average of 41 citations in 2002, 416.5 in 2007, 20 in 2008, 58.4 in 2010, 39.8 in 2011, 53.83 in 2014, 25.47 in 2015, 36.55 in 2016, 20.08 in 2018, 9.35 in 2019 and 2021. Article output has increased in Journals like Frontiers, Journals, Financial Services Marketing, and Sustainable Switzerland. The most papers were written by Mitchell OS, who was followed by Lusardi A, Zhang Y, Garca-Santillán A, Adil M, Kadoya Y, and Fong JH.

Since their debut publication, Mitchell OS, Lusardi A, Kadoya Y, Zhang Y, Adil M, and Ahmed Z have all garnered an average of 0.5 citations each year. The United States has the greatest level of scientific output, followed by India, Indonesia, Australia, and China. With 1476 total citations, the United States, the Netherlands, Australia, Italy, India, China, Germany, the United Arab Emirates, and Singapore have significant scientific influence. These articles have earned several citations, suggesting their relevance in advancing scholarly discussions and giving insights. The most commonly used keywords in a given context are investment, literacy, finance, financial system, investments, financial literacy, education, human, decision making, energy efficiency, female, and savings, showing a high emphasis on investment-related issues. In conclusion, the study reveals the increasing demand for financial literacy and then investment, identifies key writers and publications, and emphasises the importance of certain nations in this subject. The findings also highlight the importance of investment-related subjects and the importance of financial education.

4.1 Future Research Directions

Longitudinal analysis, comparative studies, impact assessment, intersectionality, behavioural finance, technological advancements, cross-disciplinary approaches, policy as well as regulation, financial knowledge delivery, and sustainable finance are some future research directions in the field of financial literacy and investment. These study directions will assist academics in developing effective methods, policies, and interventions to increase financial literacy, make investment choices, and empower individuals to attain better financial outcomes. Longitudinal analysis entails performing studies over an extended period to track the advancement of knowledge about finances and investing research beyond the present timeframe. Comparative studies entail doing research across nations, regions, or demography to investigate differences in financial literacy as well as investment levels, variables influencing financial behaviour, and the efficacy of treatments. The examination of the real-world impact on financial literacy programmes and interventions to determine their success in increasing financial knowledge, behaviours, and results is known as impact assessment. Exploring how financial literacy and investing connect with other areas such as gender, socioeconomic position, culture, and ethnicity is what intersectionality is all about. Behavioural finance is the use of behavioural finance insights to acquire a greater awareness about the psychological biases, Heuristics, and decision-making processes that impact financial decisions and technological innovation.

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