

Performance Analysis and Comprehensive Science Mapping on Financial Literacy and Financial Market Participation Using Bibliometric Technique

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Abstract

Purpose – The key objective of this research paper is to conduct a performance analysis to highlight the most productive and impactful research in the domain of financial literacy and financial market participation and to conduct comprehensive science mapping to visualise the data and identify the links between different fields of research.

Research Methodology- A total of 398 documents published between the time span of 1981 to 2022 were extracted from the Scopus database. Bibliometrix, a free and open-source software, is used to perform both descriptive as well as network analysis.

Findings- A rising trend was witnessed in research associated with financial Literacy and financial market involvement, with an annual growth rate of 16.48% in annual scientific production on the topic. Sustainability Journal was found to be the most dominant source for literature in this field of research. America, China, and India are the top countries working in this area. Among academics, the concept of financial literacy continues to garner a growing amount of interest, since 1997. As a corollary, the evolution analysis shows an upsurge in investigating how market involvement is related to a person's level of financial literacy. Keywords like portfolio choice, Investment decision, financial planning, financial well-being, household portfolio, and market volatility, risk assessment, electronic trading, financial crisis were discovered, which have not been explored much. Factor Analysis focuses on two key factors as financial literacy and stock market.

Limitations & recommendations for future research- Data was solely extracted from Scopus database. In future, researchers can access other databases too.

Novelty- Previous researchers have conducted bibliometrics analysis on financial literacy, financial literacy and retirement planning, financial literacy, and its influence on financial behaviour, but so far, no work has been done related to science mapping on financial literacy and financial market participation.

Significance-This study will assist researchers in finding the prominent work on financial literacy and active participation in financial market and to uncover the emerging trends in this domain.

Keywords- Financial literacy, Financial market participation, Stock market, Bibliometrics Analysis, Science Mapping

1 Introduction

1.1 Financial Literacy

Financial literacy is a guiding light that can enlighten the path to financial market participation. Financial literacy infuses confidence in investors to invest in financial markets. As a result of the advancement of financial innovation driven by monetary liberalisation, financial products and services in advanced nations have become more dynamic and complex in recent years (Kamiya,2017), which necessitates individuals to possess higher levels of financial literacy so as to deal confidently in them. Today, the financial landscape is fraught with uncertainties due to the prevalence of complex financial products, shady financial institutions selling Ponzi schemes, and a highly volatile stock market. It is crucial that we have a firm grasp of the finance that can help us to safeguard ourselves from financial fraud. “Financial literacy refers to knowledge and awareness about financial products, skills to apply learned knowledge confidently, attitude, and behaviour required to make sound financial decisions”. “Financial Literacy is the capability to examine complex financial products and make informed judgments related to the choice of financial product which suits best to their financial goals and maximize their financial well-being in long-run”(Mandell & Klein, 2007). Financial literacy not only assists individuals in preparing structured budgets, managing debts, calculating interest, risk, and return but at the same time can help individuals

to choose the best financial products out of various complex options available in insurance plans, mortgages, pension funds, shares, debentures, other financial derivatives such as futures and options and private equity investments (Lantara & Kartini, 2016). As a general concept, financial literacy refers to the capability to utilize knowledge of financial market products, including both their potential benefits and dangers, to make prudent decisions. The term "financial literacy" refers to a person's aptitude for making sound decisions and assessments concerning the acquisition, custody, and control of monetary resources (Ramakrishnan, 2011). For their own long-term benefit, individuals need the capacity to appraise the new and sophisticated financial instruments and make educated judgements related to the choice of instruments and their use (Servon & Kaestner, 2008).

1.2 Financial Market Participation

One of the notable financial events occurred during the COVID-19 pandemic was a sharp increase in investor engagement in the financial market through platforms for financial services that are web- and mobile-based (Singh, 2021). One of the most important determinant that encourages involvement in the financial market is the degree of financial literacy that investors possess, since this gives them an advantage while making decisions regarding their finances. When consumers do not possess the abilities to successfully manage their funds, market functioning and competitive forces are jeopardised. A more competitive, vibrant and effective market is fostered by informed players in the market (Subha & Shanmugha, 2014). Financially literate people are more likely to invest their money in the stock market (M. van Rooij et al., 2011). Conversely, people who have paucity of financial knowledge have low tendency to invest in stock market as they lack financial confidence. Lusardi & Mitchell (2007) asserted that having a good understanding of finances is a crucial factor in portfolio management. People's hesitation to invest in the stock market is due to paucity of financial literacy (Kadoya et al., 2017). Provision of financial education can promote participation in stock market (Hermansson et al., 2022).

1.3 Bibliometrics Analysis

Pritchard was the first among researchers to throw light on the concept of bibliometrics in 1969. In recent years there is a sharp rise in the amount of focus placed on bibliometric and scientometric methods in a variety of academic disciplines. This is due to the fact that these techniques are very effective in visualising the knowledge development and identifying topics of rising concerns (Jho, 2018). Various methods of qualitative and quantitative literature reviews are utilised by academics in order to comprehend and arrange previously gathered information. Bibliometrics has the ability to create a review process that is rigorous, credible, and replicable. This approach is based on the statistical measurement of research conducted, researchers who have worked on that particular topic, or scientific activity (Broadus, 1987; Diodato & Gellatly, 2013). Bibliometrics, in contrast to other methodologies, provides insights that are more unbiased and authentic. Bibliometrics is useful when we have data in abundance as it organises large information, that allow us to conclude trends over time, themes developed, pinpoint the most prolific academics and institutions, and provide an overall perspective of the state of existing research (Crane, 1969).

In bibliometric analysis, two main techniques are used viz. performance analysis and science mapping (Noyons et al., 1999; Van Raan, 2005). Performance analysis investigates the contributions that various research groups (such as authors, institutions, nations, and publications) have made to a given research area (Cobo et al., 2011). The descriptive aspect of bibliometric study is distinguished by Performance Analysis. (Donthu, Reinartz, et al., 2021). The majority of reviews, show performance analysis which only represents the performance of various research constituents in the area. The number of publications and citations each year are the two measures that are used most frequently, where citations are indicators of influence and publications serve as indicators for productivity. Despite its descriptive nature, the analysis acknowledges the significance of various constituents within a particular area of study (Donthu, Kumar, et al., 2021).

Science mapping enables statistical analysis of scientific knowledge. Researchers use "science mapping" to investigate the interconnections between authors, affiliations and nations working in a particular research area (Cobo et al., 2011). Many methods can be used to conduct science mapping. When paired with network analysis, these methods are useful for outlining the scholarly community's bibliographical and conceptual frameworks (Chen, 2017).

2 Objectives of the study

The primary goal of this research is to highlight the recent findings related role of financial literacy on active participation in financial markets. The following questions help to define the study's purview.

Research Question 1-What are the most relevant sources which are publishing work related to financial literacy and involvement in financial market and What is the impact and growth rate of these sources.

Research Question 2- Who are the most relevant authors working in the domain of financial literacy and involvement in financial market. What is the impact of these researchers on the research community. What are the most relevant affiliations and which countries are playing the most significant role by providing the maximum contribution in the sphere of research on financial literacy and investment in financial markets.

Research Question 3 - What are the most relevant studies and most commonly used terminology in this research domain. What are the trending topics in past 5 years?

Research Question 4 - What are the emerging themes in this research domain?

Research Question 5 – What is the intellectual framework of research and how has this research evolved over time.

Research Question 6- Which countries, authors, and institutions are collaborating to conduct research on financial literacy and participation in financial market?

3 Research Methodology

This research has utilized the data extracted from Scopus. Scopus is one of the most popular and credible database for scientific articles (Singh, 2021). The most popular and effective research databases available are Web of Science and Scopus which can be utilized for gathering data for analysis (Pranikutè, 2021). Many researchers have suggested Scopus to be a better option for carrying out research in the areas of arts and humanities.

This study includes descriptive analysis as well as network analysis. Under descriptive analysis most significant sources, key authors working in the domain of financial literacy and involvement in financial market, and the most relevant documents were identified. (Fig. 1) shows that under network analysis, three structures are examined, viz. conceptual structure, intellectual structure, and social structure. Conceptual structure helps in recognising different themes such as Emerging themes, Basic themes, Motor themes, and niche themes which helps in identifying the trends; the social structure examines the collaboration network among researchers, academic organisations, and nations and the collaboration world map. The intellectual structure explains how a researcher's work exerts influence on other researchers' work(Aria & Cuccurullo, 2017).

3.1 DATA

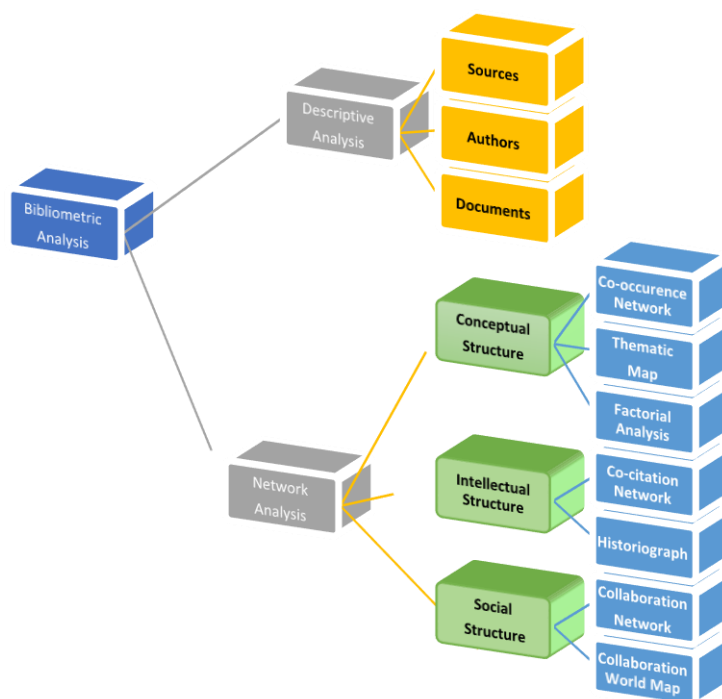


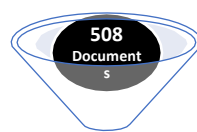
Fig. 1 Elements of Bibliometric Analysis

This dataset was extracted from SCOPUS database. The following search string was used (("Financial Literacy" OR "Economic Literacy" OR "Financial Knowledge" OR "Financial Education" OR "Financial Attitude" OR "Financial Behaviour" OR "Financial Ability" OR "Financial skills") AND ("Financial Market" OR "Capital Market" OR " Money Market" OR "Stock Market" OR "securities Market" OR " Stock Exchange" OR "Share Market")) . Boolean operators AND & OR were used to make search string more effective. Occurrences of these keywords were searched in Article Title, Abstract, or Keywords. Rigorous review of literature suggests various synonyms of financial literacy which were used by applying OR Boolean operator. Kamiya(2017)stated that financial knowledge and economic literacy are synonyms of financial literacy. Financial education, financial knowledge, and financial literacy are frequently used interchangeably in academic researches (Huston, 2010). At the same time various dimensions of financial literacy such as financial knowledge, financial skills, financial attitude, financial ability, financial behaviour were also used in the search string. For financial market, its component money market and capital market terms were used. In the initial stage of Data analysis, the stock market was found to be one of the keywords, so later, stock market and its related term were also added to the search string, and then once again, the Scopus database was examined to identify work conducted in this domain.508 documents were extracted from Scopus database as a result of this search. However, the research was confined by considering only final documents and excluding those articles which are in press. Further, Articles written in languages other than English were discarded, i.e documents written in english were only considered. Papers between the time span 1981-2022 were considered. Paper from selected subject areas were considered, and only articles, conference proceedings, and review were considered, after the refinement process, 398 documents were found, which were used for further analysis (Fig. 2)

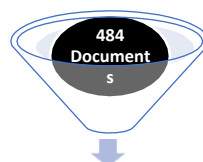
3.2 Tool used for Bibliometrics

To perform science mapping, bibliometric technique is employed for this research. It is a tested research technique used in library and information science to analyse scientific researches in order to increase the efficacy and productivity of libraries (Tella & Aisha Olabooye, 2014). Several software are available for carrying bibliometrics analysis(Moral-Muñoz et al., 2019) like BibExcel(Åström et al., 2009), CiteSpace (Ping et al., 2017), Histcite(Garfield, 2009) which are used for conducting bibliometric studies coupled with various data visualisation tools for attractive presentation of data such as VOSviewer(Orduña-Malea & Costas, 2021) , Pajek (Mrvar & Batagelj, 2016) and Gephi (Cherven, 2013). The power of bibliometrix lies in the fact that it is a systematic, clear, and repeatable procedure for organising contributions on a certain topic. In addition, bibliometric analysis can be used to remove bias from the review process (Della Corte et al., 2019). The data in this study was analysed using Biblioshiny (Aria & Cuccurullo, 2017), an application present in the Bibliometrix package of R Studio. This package makes it easier to conduct thorough bibliometric research, including data analysis and visualisation. Many softwares available for bibliometrics are difficult to access due to commercial licenses and at the same time they are arduous to operate. Conversely, Bibliometrix is free and open-source software manageable to operate and allow users to perform both descriptive as well as network analysis. It can be even efficiently used by non-coders as its interface is extremely user-friendly (Ingale & Paluri, 2020)

Filtration Process



Documents were filtered on the basis of Publication Stage -Only final documents were considered and Articles in press were removed



Documents were filtered on the basis of Language -Only English language documents were considered and documents of rest all other languages were removed

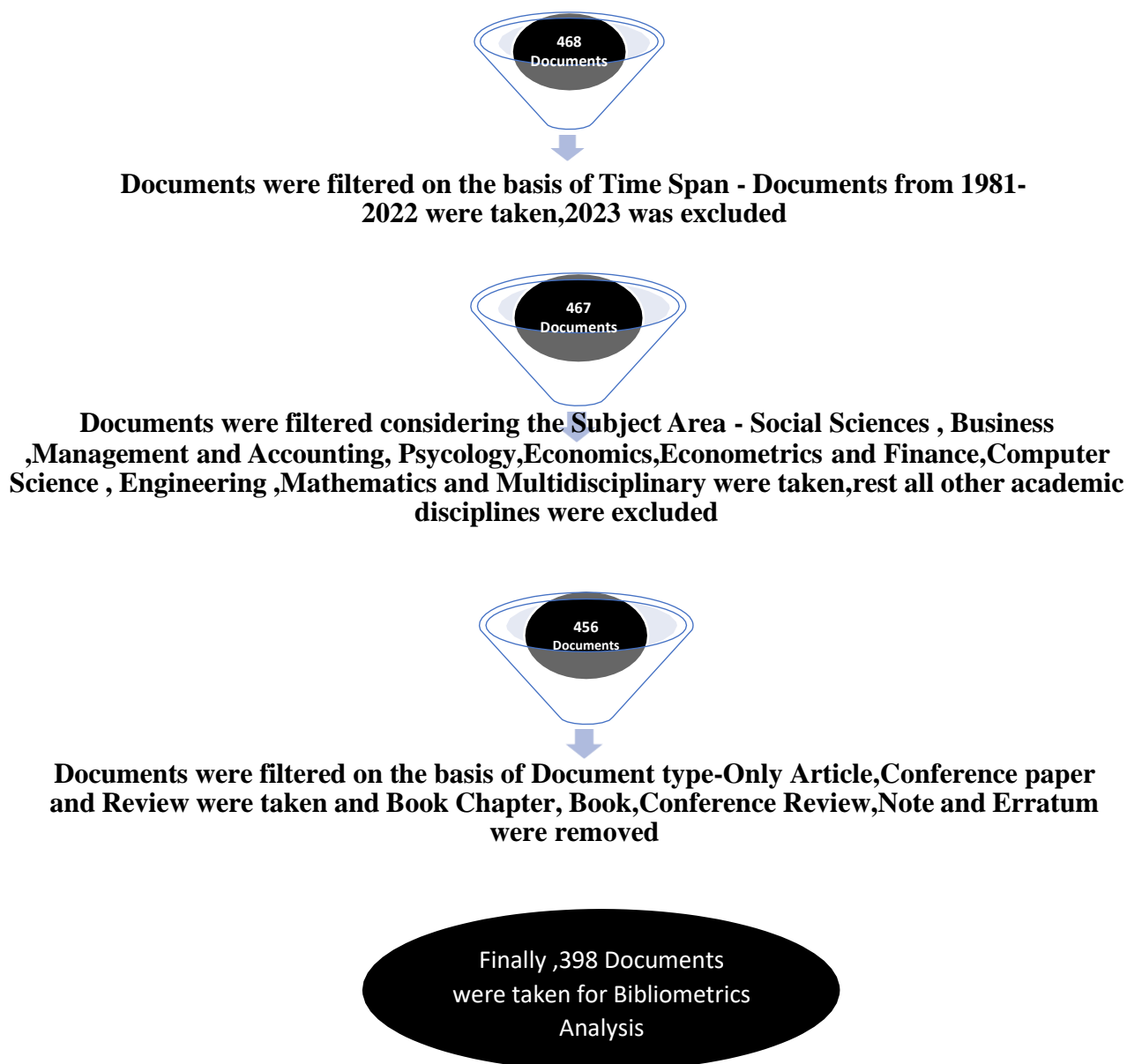


Fig. 2 Filtration Process

4 Results and Findings
4.1 Descriptive Analysis

Description	Results
MAIN INFORMATION ABOUT DATA	
Time Span	1981:2022
Sources(Journals, Books,etc)	286
Documents	398
Average years from publication	4.84
Average citation per documents	13.7
Average citation per year per doc	1.866
References	17263
DOCUMENT TYPES	
Article	336

Conference Paper	44
Review	18
DOCUMENT CONTENTS	
Keywords Plus (ID)	737
Author's Keywords(DE)	1159
AUTHORS	
Authors	939
Authors Appearances	1025
Authors of single-authored documents	76
Authors of multi-authored documents	863
AUTHORS COLLABORATION	
Single-authored documents	79
Documents per Author	0.424
Authors per Document	2.36
Co- Authors per Documents	2.58
Collaboration Index	2.71

Table 1 Main Information Source : Author' Elaboration using Biblioshiny

(Table 1) exhibits the key information related to the final data extracted from Scopus database. A total of 398 studies from 298 sources which were published between the Timespan of 1981 to 2022 were considered. When compared to the total number of documents, the number of Author's keywords used is three times more. Keyword plus count was found to be 737 which was around twice the number of documents. The terms chosen by the Author to best describe the document's content are known as Author's keywords where as Keywords plus are the words that are commonly found in the titles of references in a document and not necessarily in the title of the document or as Author Keywords(Zhang et al., 2016). Authors per document is 2.36 which implies that each article typically includes at least two authors. The collaboration index (CI) is 2.71 which is computed as $(863/319=2.71)$, here 863 are the number of authors of multi-authored documents and 319 are the number of multi-authored article which is derived by deducting single-authored documents (79) from the total number of documents (398)). (Secinaro et al., 2020)

A 31-year era of scientific productivity is included in the analysis. But it was after 2009, that there was a substantial rise in the number of articles published. Compounded Annual Growth Rate found in the average scientific production was 16.48% (Fig. 3). To compute the average number of citations received each year, the total number of citations received is divided by the number of years that the author or journal has been publishing papers. This gives the average number of citations received each year. As per our data research articles published in 2011, are getting the maximum number of average total citations per year followed by article published in 2002 (Fig. 4).

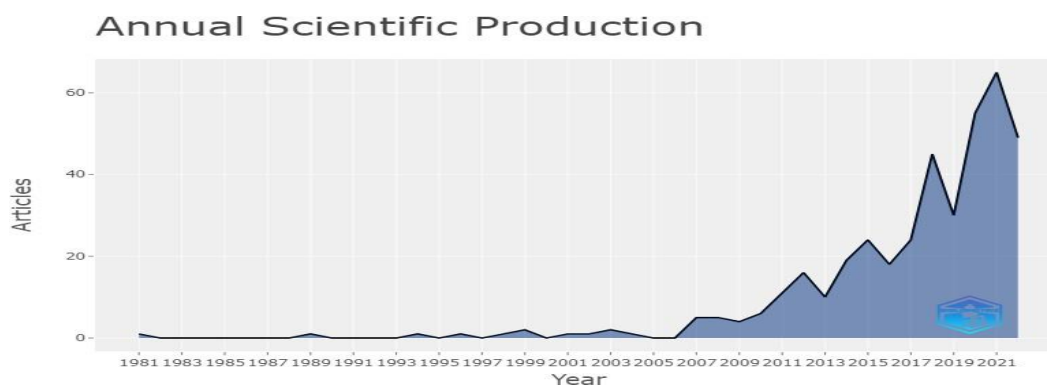


Fig. 3 Annual Scientific Production

Source : Author' Elaboration using Biblioshiny

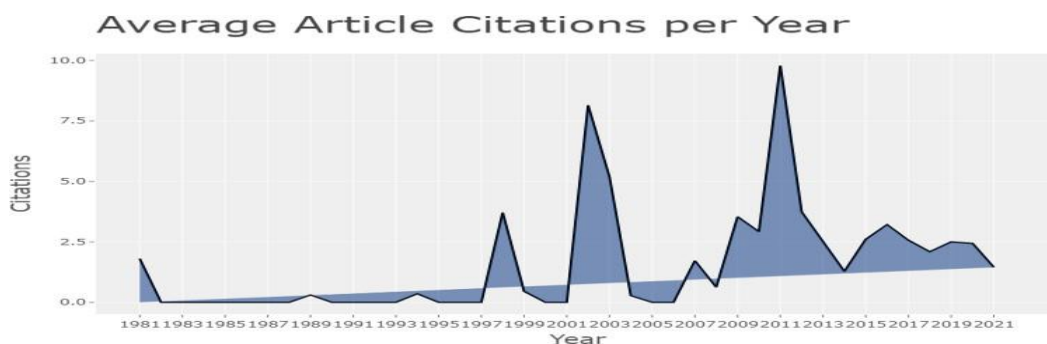


Fig. 4 Average Article Citations per Year Source : Author' Elaboration using Biblioshiny

Three fields plot

The three field plot illustrates the relationship between the three fields through the use of Sankey plots, in which the size of each part is proportionate to the value of the corresponding node (Riehm et al., 2005). The Sankey Plot (Fig. 5) displays author nationality on the left, keywords in the middle, and the sources used for the study on the right. All ten words showed eminent keywords accompanied with the sources and the country which are working rigorously on them. USA, China and India are working prominently on each of the 10 top keywords explored.

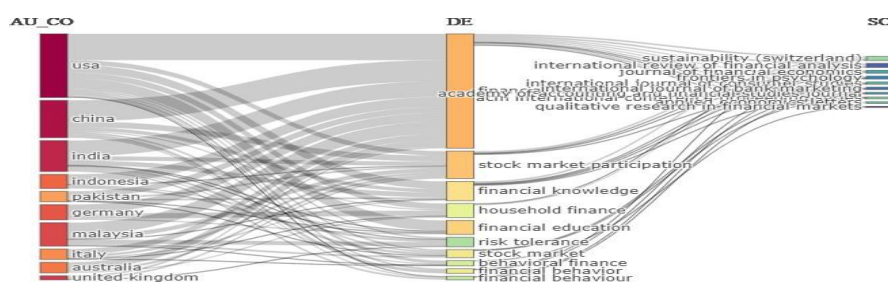


Fig. 5 Three Fields Plot Source : Author' Elaboration using Biblioshiny

4.1.1 SOURCES

The most productive sources in the field of publication in the domain of financial Literacy and active participation in financial market are mentioned in (Fig. 6). The major source that published most of the articles is "Sustainability" which is an international open access journal originating from the Switzerland. The figure shows the Top ten sources. Each of the source has contributed at least 4 documents in the research area.

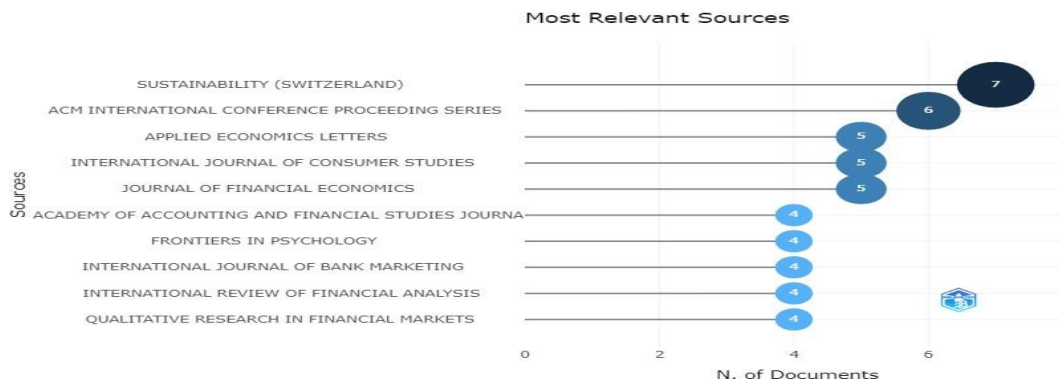


Fig. 6 Most Relevant Sources Source: Author's Elaboration using Biblioshiny

A journal, book, conference proceedings series, or other publication that is mentioned in reference lists of the document is considered to be a cited source. The frequency with which a source that is listed in this collection has been cited by

documents that are also included in this collection is indicated by the number of local citations.. In our data we have 7712 cited sources included in the 398 document bibliographies. (Fig. 7) includes the top 10 locally-cited sources.

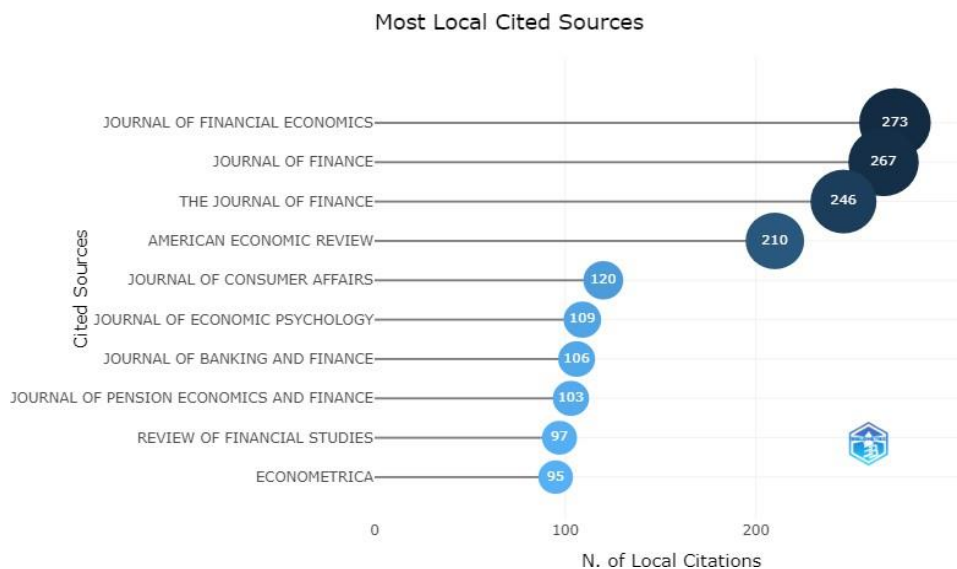


Fig. 7 Most Local Cited Sources Source: Author's Elaboration using Biblioshiny

Bradford's Law

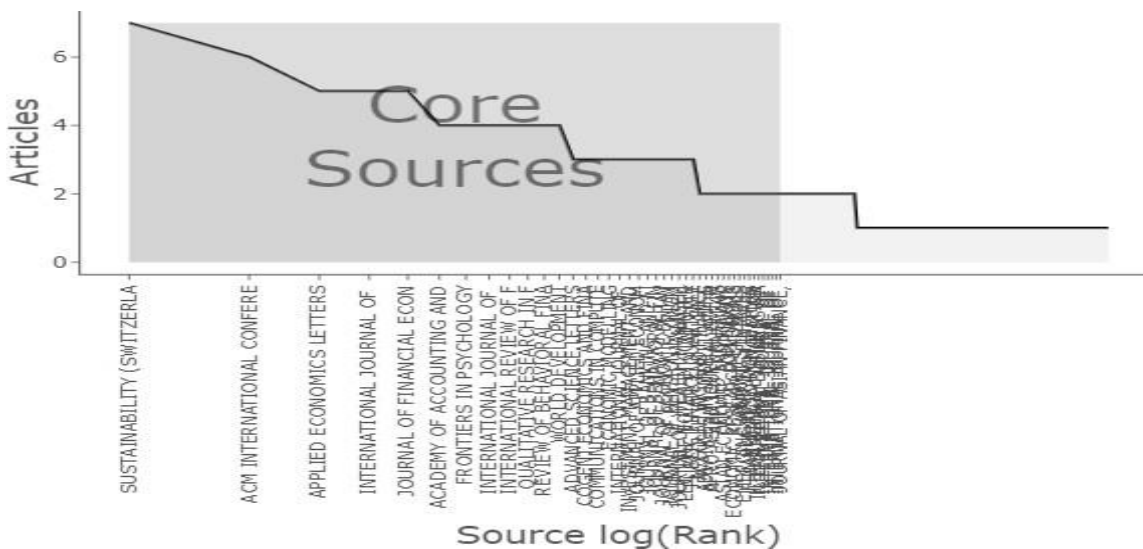


Fig. 8 Core Sources as per Bradford's Law Source: Author's Elaboration through Biblioshiny

Bradford's law, a pattern that forecasts the exponentially declining returns of searching for references in scientific journals, was first described by Samuel C. Bradford. In 1934, Bradford introduced this rule. According to one formulation, if the journals in a field are classified into three groups based on the number of articles, with each group holding approximately one-third of the total number of articles, the number of journals in each group will be proportional to $1:n:n^2$. This law emphasises the fact that there will be fewer journals with more articles and a greater number of journals with fewer articles published in them. There were total 398 articles; when they were divided into three groups, it was discovered that the core zone (Fig. 8) comprised 43 journals with 132 articles published in it, the Middle zone had 112 journals with 135 articles, and the minor zone had 131 journals with 131 articles (Fig. 9). It can be concluded that (43:112:131) doesn't coincide with $1:n:n^2$.

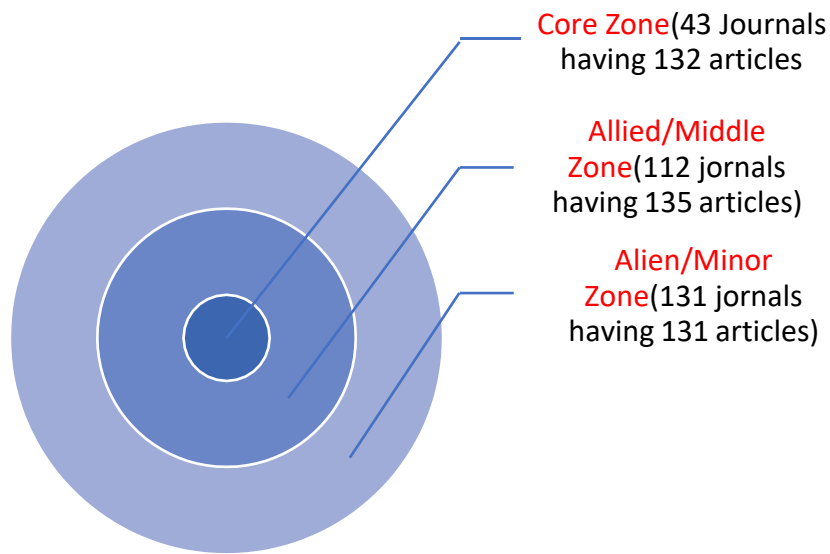


Fig. 9 Three Zones of Journal Source: Author's Calculation

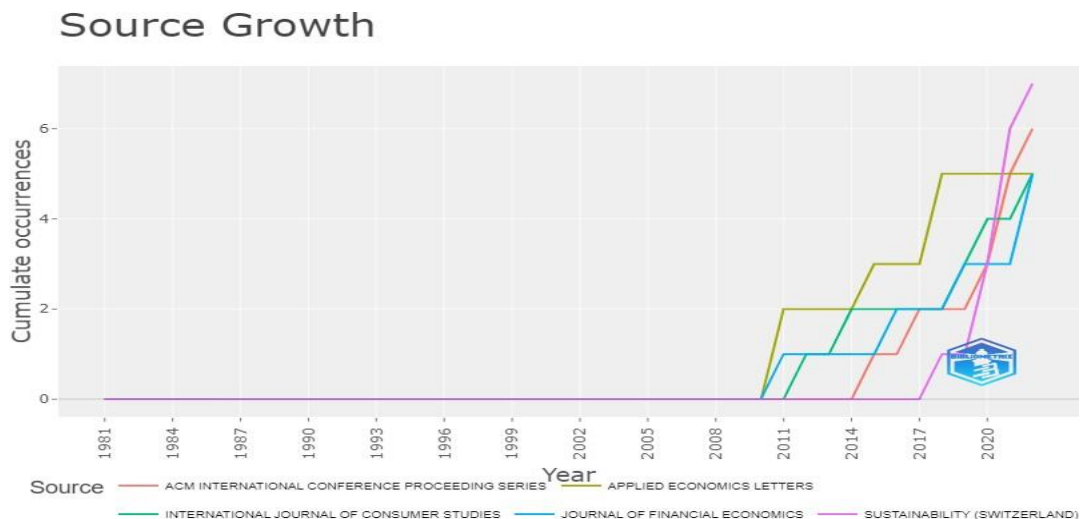


Fig. 10 Source Growth Source : Author' Elaboration using Biblioshiny

(Fig. 10) shows that after the year 2010, there was a discernible increase in the total number of research publications that were devoted to the subject. It includes as variables the quantity as well as the publishing time of the journal under analysis. The most significant growth was seen in Sustainability journal.

4.1.2 Author Most Relevant Authors

According to the data in the (Table 2) the authors listed below have the most published works, with each Author having produced at least three publications. The next statistic in this list comprises of authors that have not had more than two publication each. Although some researchers have published as the primary authors of their works, the majority of researchers have published as co-authors.

Authors	Articles	Articles Fractionalized
Zhang Y	7	1.90
Lusardi A	5	2.50
Chatterjee S	4	1.50
DAS N	3	1.33
Klapper L	3	1.33
LI X	3	0.75
MERKOULOVA Y	3	1.50
MITCHELL OS	3	0.83
MOUNA A	3	1.50
VELD C	3	1.50

Table 2 Most Relevant Author Source : Author' Elaboration using Biblioshiny

In terms of author performance, Zhang Y has contributed maximum number of articles which counts to be 7, whereas in context of fractional authorship Lusardi performed exceptionally well. Fractional authorship signifies authorship of a document written by more than one author. Zhang have contributed 7 articles in this research domain and had 1.90 articles fractionalised, which depicts that 27% of articles written by him are in collaboration with other authors. Lusardi has contributed 5 articles and have 2.50 articles fractionalised, meaning 50% of her articles are produced in collaboration with other authors. None of the authors in most productive authors list was found in most local cited authors(Fig. 11)

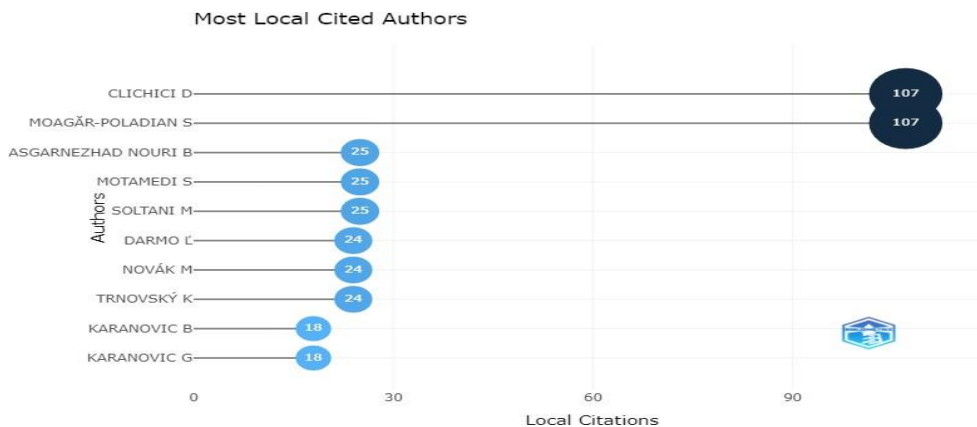


Fig. 11 Most Local Cited Author Source : Author' Elaboration using Biblioshiny

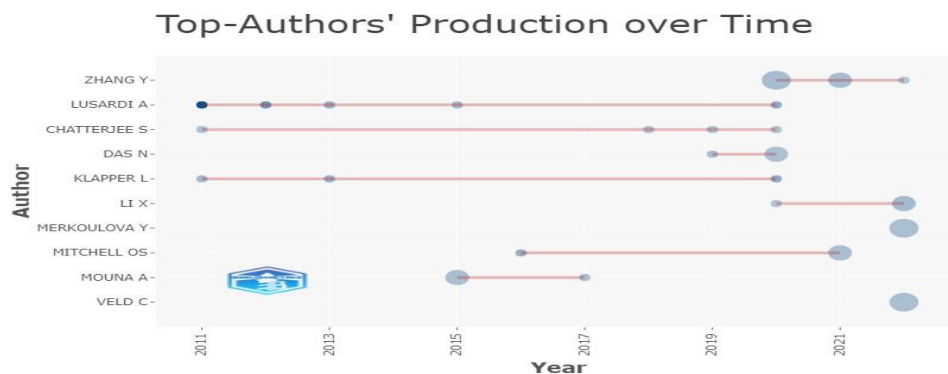


Fig. 12 Top Author's Production over Time Source : Author' Elaboration using Biblioshiny

Three factors need be considered while interpreting this (Fig. 12) the line, the circle's size, and its colour. An author's timeline is displayed on the line. Lusardi, Chatterjee, and Klapper has longest timeline from 2011 to 2020. The size of the circle is directly proportional to the total number of documents that the researcher has produced, the larger the circle, the more number of papers the researcher has produced. like Zhang has authored 3 articles in 2020, and the colour intensity corresponds to the total number of citations received annually to that Author's articles (Saqr et al., 2021). Lusardi 2011 documents have received 86.08 total citations per year.

LOTKA'S LAW OF PRODUCTIVITY OF AUTHORS

Lotka's law, also known as inverse-square law, works on the fact that there will be few authors contributing to large number of articles and large number of authors contributing to a fewer number of articles. It gives an account of the number of times authors publish their work on a particular topic. Lotka's law states that number of authors who have written n number of research papers will be about $1/n^2$ of the number of authors who have written a single document(Friedman, 2015). (Table 3) represents the actual data on authors writing n number of documents. (Table 4) shows number of authors writing n number of documents as per Lotka's law. (Fig. 13) shows frequency distribution of scientific production. It can be concluded that Lotka's law doesn't hold its significance in this data set.

Table 3: No. of Documents written by Authors Table 4: No. of Author's as per Lotka's Law

Source: Author's Elaboration through Biblioshiny

Documents written	N. of Authors	Proportion of Authors
1	870	0.927
2	59	0.063
3	7	0.007
4	1	0.001
5	1	0.001
7	1	0.001

Documents written	N. of Authors(using Lotka's Law)
1	870
2	217(870×1/2 ²)
3	97 (870×1/3 ²)
4	54 (870×1/4 ²)
5	35 (870×1/5 ²)
7	18 (870×1/7 ²)

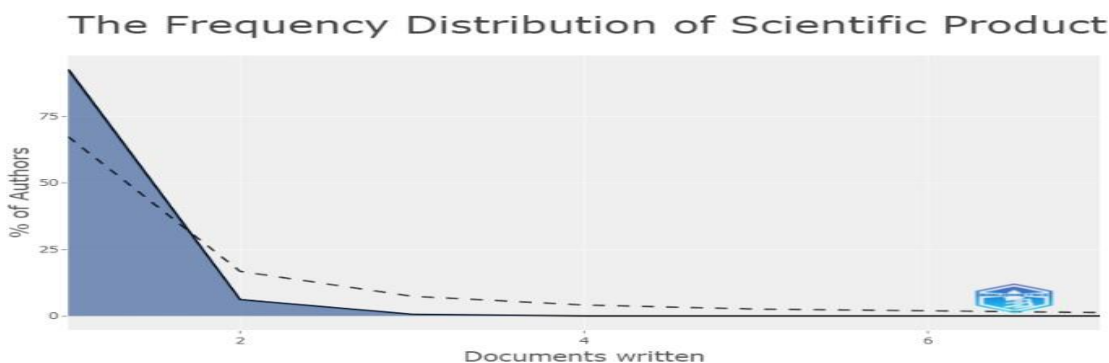


Fig. 13 Frequency Distribution of Scientific Production Source: Author's Elaboration through Biblioshiny

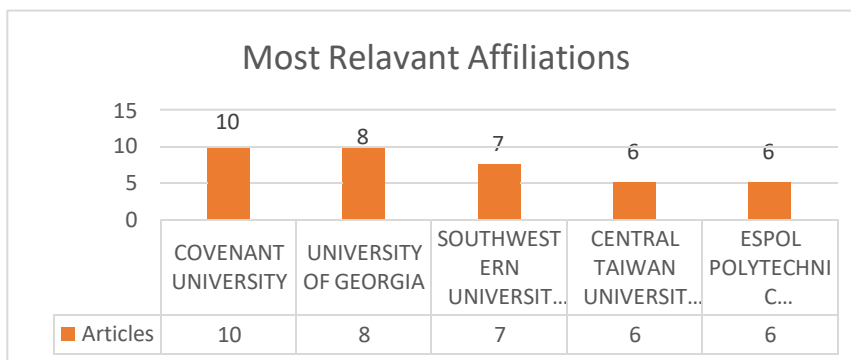


Fig.14 Most Relevant Affiliations Source: Author's Elaboration through Biblioshiny

(Fig.14) displays 5 top affiliations which have produced the maximum literary work on the combination of financial literacy and involvement in financial market. Covenant University of Nigeria has contributed 10 articles, followed by University of Georgia from US, giving a contribution of 8 research articles, and so on.

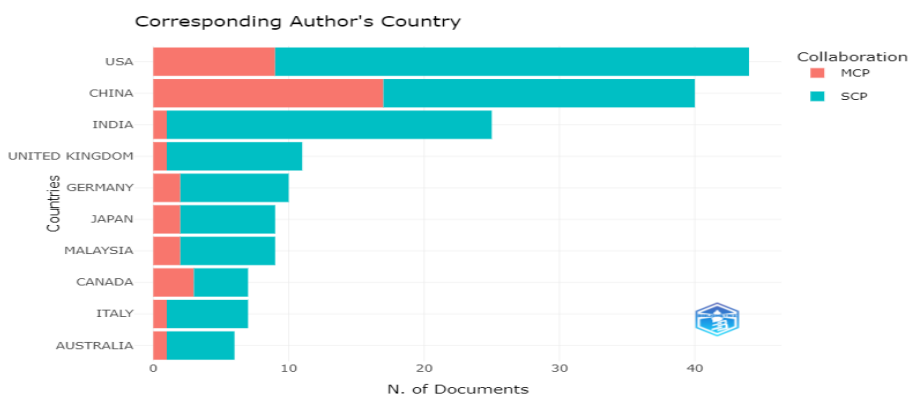


Fig. 15 Corresponding Author's Country Source : Author' Elaboration using Biblioshiny

MCP stands for "Multiple Countries Publication," and it refers to the number of documents that each nation has produced with at least one co-author from a different nation. MCP are used to quantify the level of international collaboration that a country engages in. (Fig. 15) shows that out of the top three countries producing the maximum work, China has the highest MCP, followed by USA. India has low collaboration intensity and high rate of SCP(Single Country Publications).

Country Scientific Production

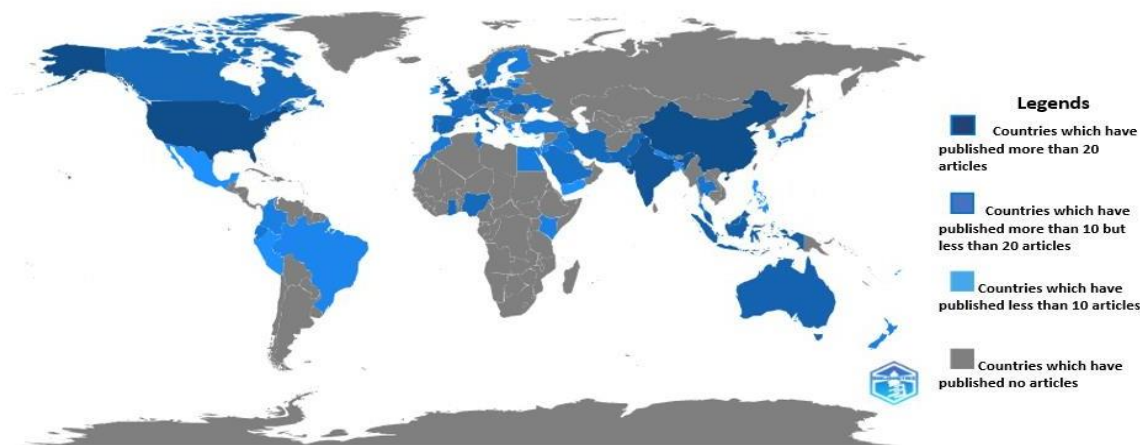


Fig. 16 Country Scientific Production Source : Author' Elaboration using Biblioshiny

(Fig. 16) display the countries which have made a major contribution to the research on the topic. The colour intensity is proportional to the number of research articles published by the country on the topic. The dark blue shades in the area of USA, China, India, and UK shows a glimpse of their prominent contribution, whereas the grey shade in the area of Russia and Africa shows a paucity of research in this area, i.e, these areas have not even contributed a single article in this field of research

Table 5 Country Scientific Production

Table 6 Total Citations & Average Articles Citation

Source: Author's Elaboration through Biblioshiny

Region	Freq.
USA	151
CHINA	135
INDIA	83
UK	42
MALAYSIA	40
GERMANY	36
INDONESIA	36
AUSTRALIA	28
ITALY	23
PAKISTAN	23

Country	Total Citations	Average Articles Citations
USA	2014	45.773
NETHERLANDS	408	102
UNITED KINGDOM	284	25.818
CHINA	245	6.125
GERMANY	216	21.6
INDIA	196	7.84
PORTUGAL	100	25
MALAYSIA	94	10.444
FINLAND	70	35

(Table 5) shows that USA, with a contribution of 151 articles, is at the top of the list of nations with the greatest number of documents on the subject. It is followed by China, which has 131 articles in the literature, India (83), the United Kingdom (42), Malaysia (40), Germany, and Indonesia, both have produced 36 articles, Australia (28), Italy, and Pakistan has contributed 23 articles. The United States of America is highly concerned about financial literacy. China and India are performing well in Asia. In Europe most significant contribution is made by United Kingdom, Germany, and Italy. (Table 6) highlights the total and average citation by nation, It is quite relevant that as USA has the highest number of research articles published on the topic, so it has maximum number of total citation received. Conversely, Netherlands have contributed only 13 publications but have highest average articles citations of 102 and second highest total citations of 402.

4.1.3 Documents

The amount of citations a research paper has got from other articles present in the data set used for bibliometric analysis is known as its "local citations," while the amount of citations it has earned from all the articles on the topic present in the Scopus database is known as its "global citations." First, two documents authored by Van Rooij are common in both the list of most global (Fig. 17) as well as most local cited documents (Fig. 18)

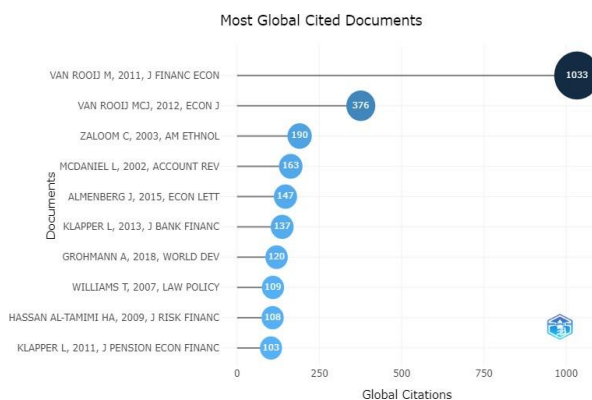


Fig. 17 Most Global Cited Documents

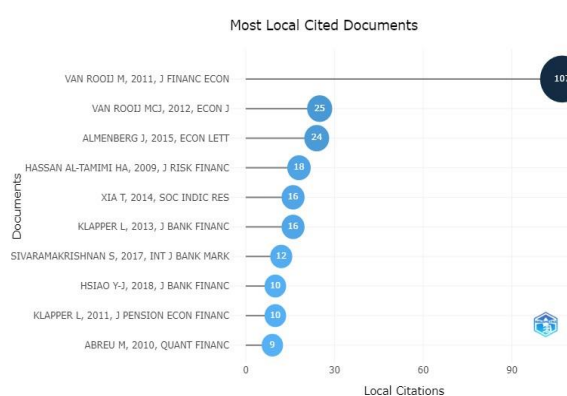


Fig. 18 Most Local Cited Documents

Source: Author's Elaboration through Biblioshiny

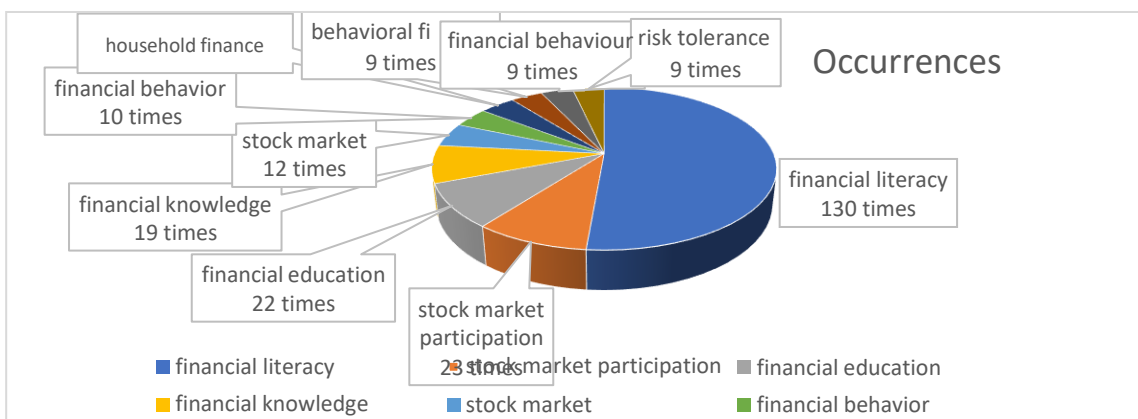


Fig. 19 Top 10 most frequent words used as per Author's keywords Source: Author's Elaboration through Biblioshiny

(Fig. 19) highlights the ten most frequent words as per Author's keywords. Elements like financial literacy, stock market, financial knowledge, and financial education, and financial behaviour matches with the keywords used. However, some other important keywords were also discovered, such as household finance, behavioural finance, and risk tolerance.

Tree Map

(Fig. 20) shows Tree map based on 50 keyword plus (i.e., those Keywords that are commonly mentioned in the titles of research papers included in the reference list of an article but are not necessarily included in article's own title)Financial market was the most frequently used term which was also present in the search string, but apart from the words entered for data extraction, some different and significant terms found were decision making, risk assessment, electronic trading, financial crisis. The figure also shows Tree map based on authors keywords, i.e., author-selected terms that best characterise the document's subject matter. Most of the authors keywords were common to the words used in the search string, some different words found were trust, risk, gender, etc. Tree map developed with most commonly used bi-grams in the titles of documents. Apart from keywords used in search string portfolio choice, Investment decision, financial planning, financial well-being, household portfolio, and market volatility were discovered. Similarly, some new keywords found from bi-grams in abstract displayed in tree map figure are financial products, financial assets, financial planning, risk attitude, and so on.



Trend Topics

The researcher can also track the term's development in the research under study with the aid of biblioshiny analysis. (Fig. 21) shows the advancement of the top ten words in the title of documents on the topic from 1981 to 2022. During the study

Fig. 20 a. Tree Map Based on 50 keywords plus, b. Tree Map based on 50 Author's Keywords

Source: Author's Elaboration through Biblioshiny

period, the topics which have witnessed most notable rise in frequency were financial literacy and the stock market. Since 1997, researchers have become increasingly interested in the concept of financial literacy. Consequently, the evolution analysis demonstrates a growing interest in exploring the association between financial literacy and market involvement.

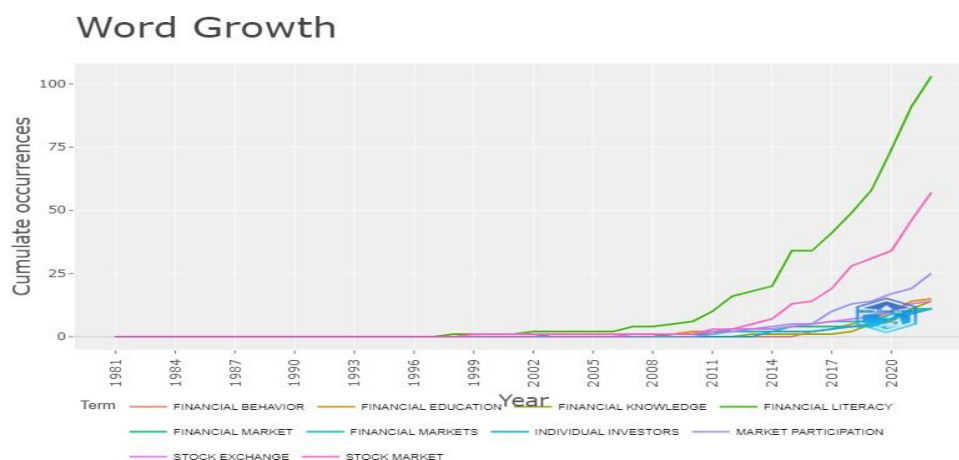


Fig. 21 Word growth Based on Bi-gram in the Titles *Source : Author' Elaboration using Biblioshiny*

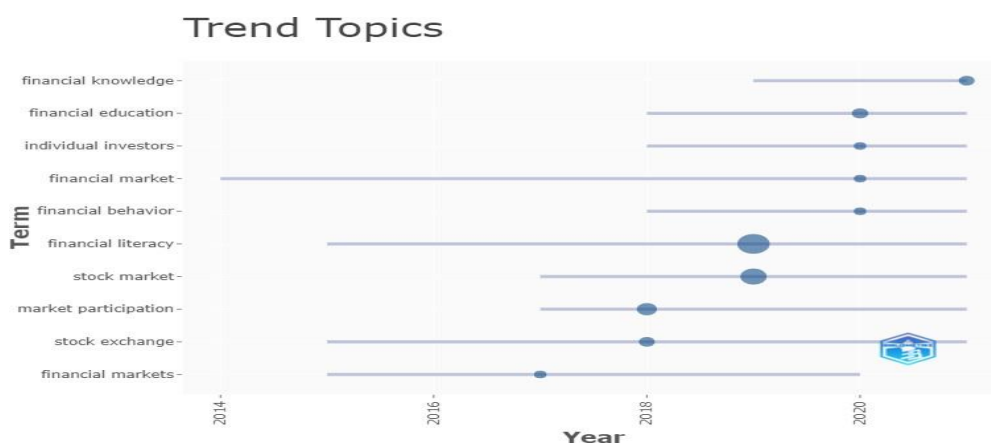


Fig. 22 Trending Topics in last 5 years *Source : Author' Elaboration using Biblioshiny*

Trending topics in last five years, i.e. 2017-2022, derived from bi-grams used in the titles of the documents, shown in (Fig. 22) having words minimum frequency of 10 were financial knowledge, financial education as they can assist in ameliorating financial literacy among investors, participation in stock markets, the effect of financial literacy on investment decisions of individuals and e on their financial behaviour.

4.2 Network Analysis

4.2.1 Conceptual Structure

It discusses about central themes and trends

Co-occurrence Network

The co-occurrence network was developed on the basis of Bi-grams in the abstract. There are different network layouts available to choose from when developing a co-occurrence network (Holten & Van Wijk, 2009). In order to obtain the above network, the automatic layout was utilised because it selects, on its own, the configuration that provides the most ease of interpreting graphs. Utilising similarity measures like Association Strength, Jaccard's Index, Equivalence Index, and Salton's Cosine are necessary in order to carry out the normalisation process for co-occurrences (Eck & Waltman, 2009). The Association Strength was used to normalise this network. In addition to this, one of the most effective clustering algorithms, known as the Louvain algorithm (Lancichinetti & Fortunato, 2009) was utilised. There are many other clustering algorithms currently accessible

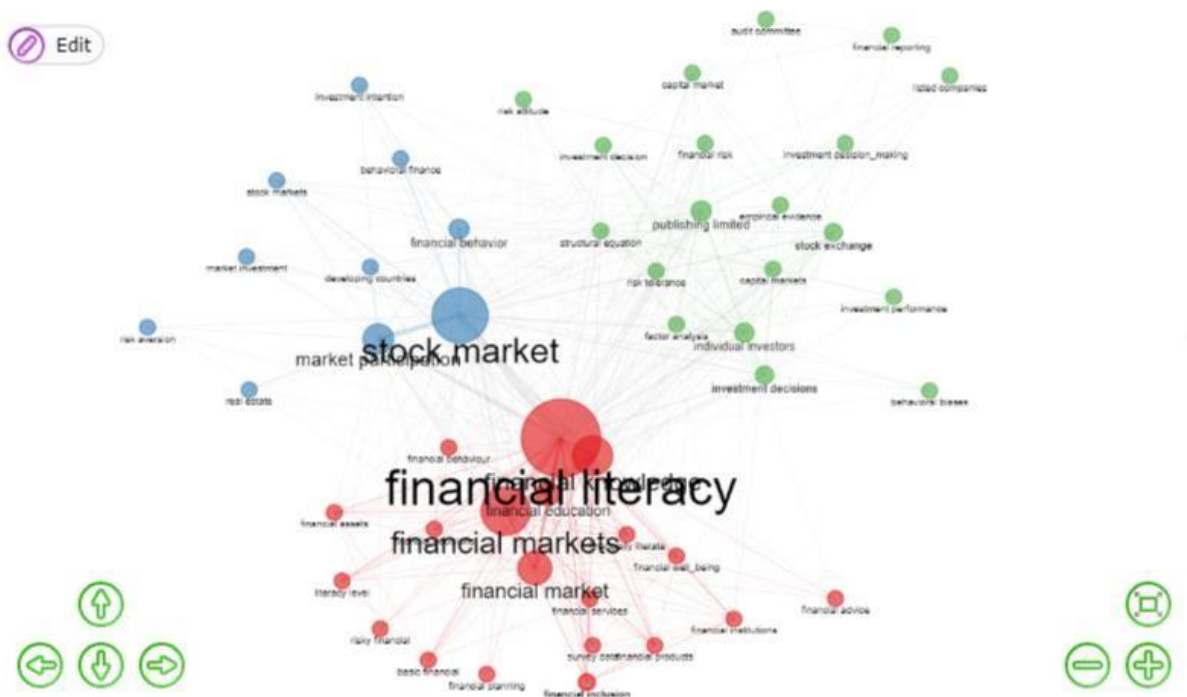


Fig.23 Co-occurrence Network Source: Author's Elaboration through Biblioshiny

In (Fig.23) the co-occurrence network comprises of several nodes which are connected through edges or lines. Each circle or node represents a word, and dimensions of the circle is directly proportional to the occurrence of the word. The thickness of the line connecting the two circles represents the co-occurrence of the words. The different colours represents the cluster to which a word belongs. This network shows 3 clusters, cluster financial literacy coloured in red, focuses on financial literacy, financial education, financial knowledge, and financial markets. It also include words like financial products and services, Financial planning, financial decision-making, and financial well-being. Second cluster, the stock market coloured in blue, is formed by stock market, market participation, financial behaviour, investment intentions. The third cluster, publishing limited which is coloured green, comprises individual investors, investment decisions, capital market, etc

Thematic Map

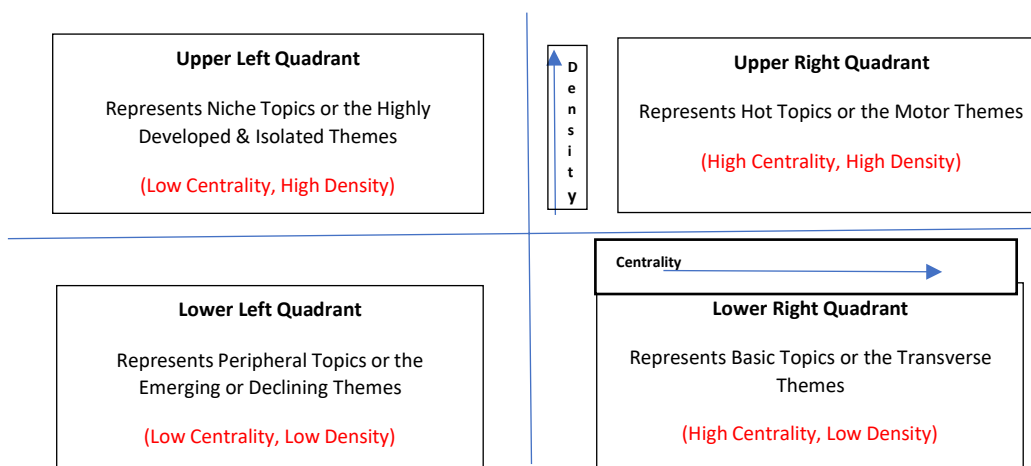


Fig. 24 Interpretation of Thematic Map

(Fig. 24) explains the method to interpret a thematic map. This map is divided into four quadrants. The topics related to the field of study are classified into 4 groups or clusters on the basis of centrality and Density. Centrality refers to the theme's significance in the complete research domain, while density measures the theme's evolution. The themes that are located in the upper right quadrant are ones that have been thoroughly explored and are of vital importance in the research field. It represents hot topics related to the study, which have high centrality and high density. These are called motor-themes. Themes in the upper-left quadrant are high in density, i.e. are well developed but have low centrality, i.e. have trivial importance in the field. Themes in the lower-left quadrant have low density and low centrality, with the vast majority of them depicting topics that are either evolving or fading. In the lower-right quadrant are subject areas that are essential to a research discipline but have not yet been explored. So, this quadrant groups basic themes. (Cobo et al., 2011; Zhang et al., 2021)

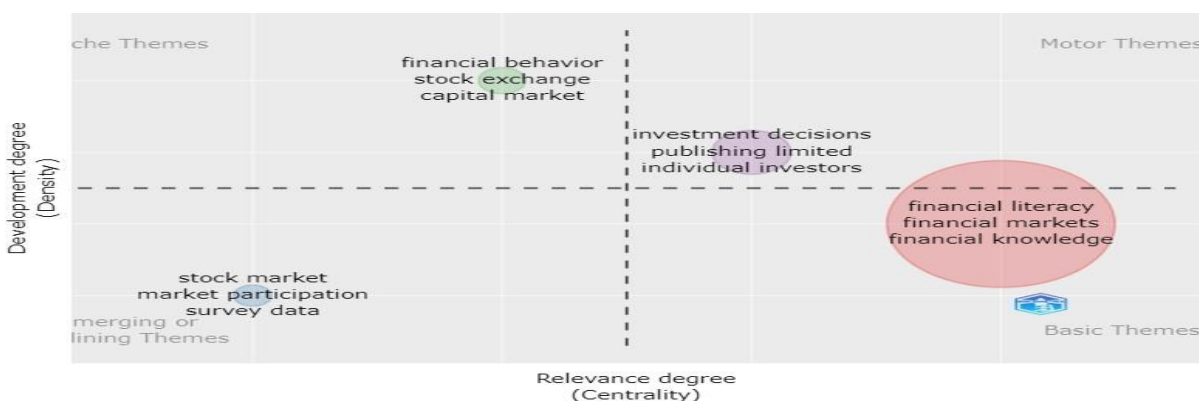


Fig. 25 Thematic Map Source: Author's Elaboration through Biblioshiny

From the content of abstracts shown in (Fig. 25), it was found that investment decisions and individual investors are the hot topics with high centrality and high density. Financial literacy, which in the earlier stages of evolution, was treated as just as the possession of financial knowledge and financial markets are basic topics. Stock market and market participation are traced in the emerging or declining theme quadrant, and concepts like financial behaviour, involvement in capital market are the niche topics.

Thematic Evolution

By splitting the complete time period into various time slices, thematic evolution analyses the complete picture of the development of the field across time. Based on the centrality and density of keyword and field components, it directs the development of the research area (Ingale & Paluri, 2020; Chen et al., 2019). By looking at the development of research on the topic, based on annual scientific production, the entire time frame (1981-2022) was divided into 3 time slices by putting two cut points at 2009 and 2016(Fig. 26).

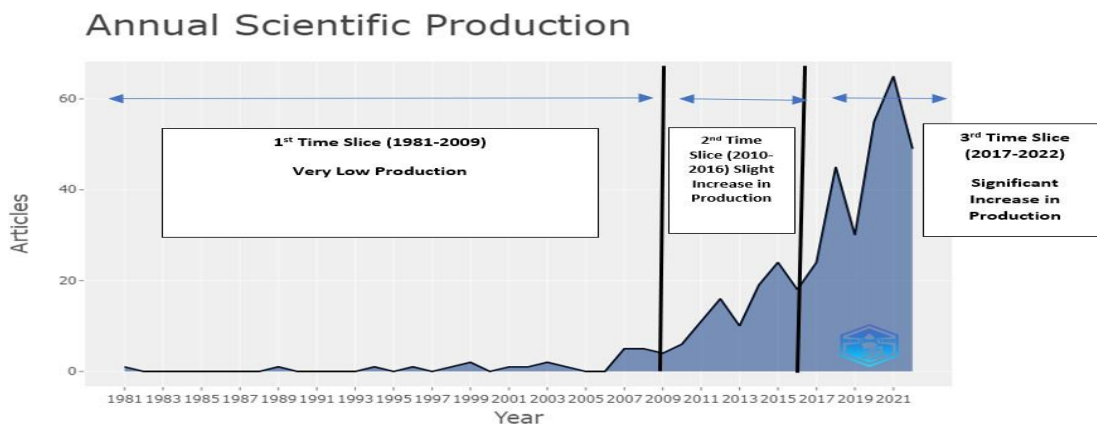


Fig. 26 Different Time Slices Source: Author's Elaboration

Under thematic evolution, we analyse the themes that have emerged over time and plot them on a Sankey diagram. The Sankey diagram aids in elucidating the scope, direction, and conversion links between various themes. The co-word analysis in each time slice suggested the key research themes, which are then displayed as nodes in the diagram. Primary keywords related to theme are marked adjacent to the nodes. The size of each node depicts the number of keywords associated with the theme. When two themes from different time slices have the same keywords, streamlines are used to connect them. The thickness of the streamline is determined by the magnitude of keywords common in the connected themes (Shi et al., 2021). In the initial stage, financial literacy was the only developed theme, but as the research in the field escalated, themes like personal finance, behavioural finance, investment decision, and portfolio choice started evolving at the greater pace. In the third stage covering the last five years (2017-2022), the research field was made more comprehensive by focussing on many new keywords, financial education, financial knowledge, stock market, and financial market participation apart from keywords explored in time span 1 and 2.

(Fig.27) shows the thematic maps of the 3 time spans. Each cluster is represented as a circle, and the larger the circle, the more terms and keywords are included in that cluster. Clusters are few in the early stages, suggesting that fewer studies focus on the topic during this time. In the first time span (1981-2009), only financial literacy is found in the basic theme i.e it is high in centrality but low in density i.e the topic is considered significantly important but not yet developed. In the second time slice (2010-2016) financial literacy is heading towards motor theme, stock market participation, financial behaviour, financial education, portfolio choice are in basic themes. In the third time slice, stock market participation has merged with financial literacy to become a motor theme, while stock market volatility, financial crimes are niche themes that can be worked upon in near future.

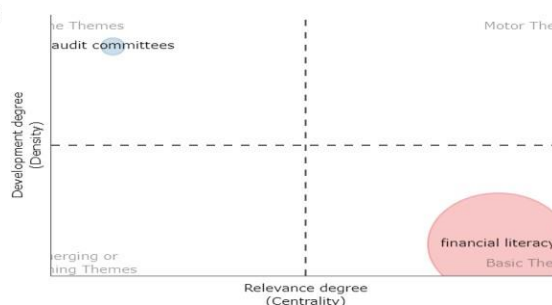
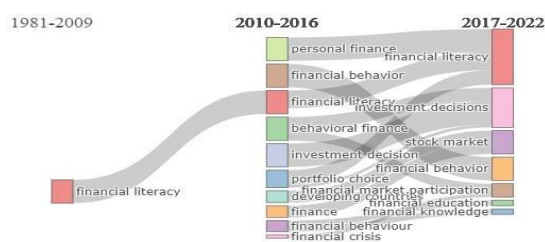


Fig 27(a) Thematic Evolution

Fig 27(b) 1st Time Slice(1981-2009)

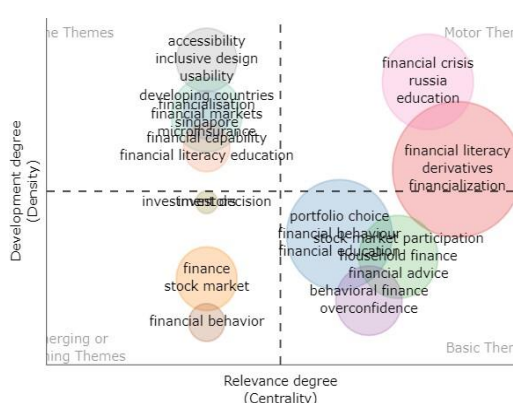


Fig 27(c) 2nd Time Slice (2010-2016)

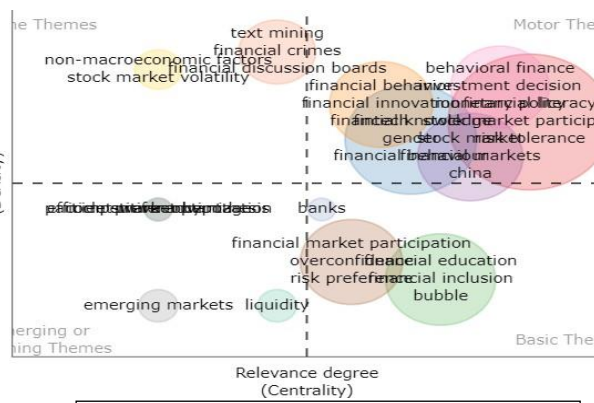


Fig 27(d) 4th Time Slice (2017-2022)

Fig.27 Thematic Map for Different Time Slices Source: Author's Elaboration through Biblioshiny

(Fig. 28) shows the abstract's bi-grams' conceptual structure is mapped using multiple correspondence analysis (Mori et al., 2016), and the abstract's keyword clusters are visualised in a two-dimensional map. The frequency with which keywords co-occur in the articles can be examined through looking at the dots on the graph each representing the keyword. The points which lie close to each other on the graph, denotes that the frequency of their co-occurrence is high i.e large number of research articles have used these words together. In addition, the keywords that lie close to the centre indicates their prominence in the research domain. Keywords around the centre have grabbed considerable focus of the researchers in academic community, whilst those on the periphery are less associated with other study areas (Shi et al., 2021).

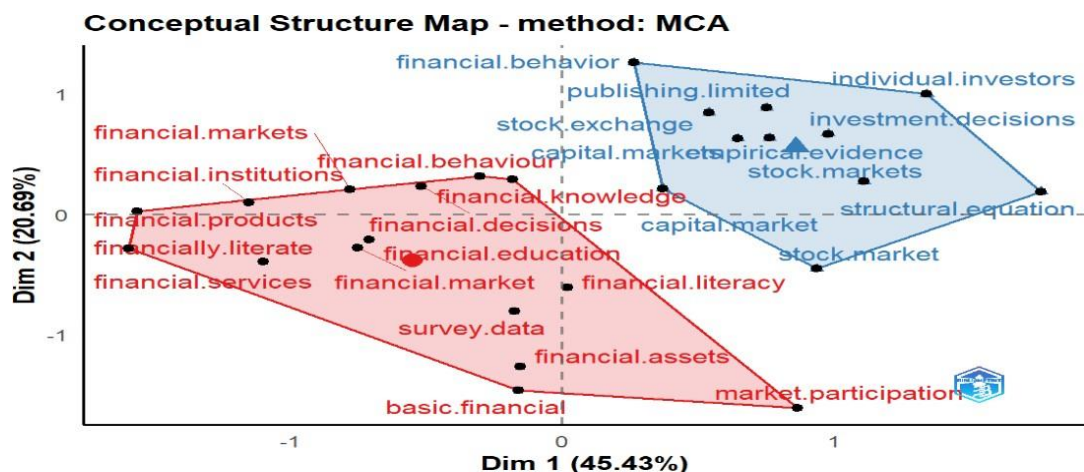


Fig. 28 Conceptual Structure Map Source: Author's Elaboration through Biblioshiny

In terms of bi-grams in the abstract, we found that the keywords fall into two broad groups. The first significant cluster in the graph, which is shown in red, contains the majority of the key research-related ideas and is quite congruent with the theme of financial literacy and participation in financial market. Financial Knowledge, financial education, financial literacy, financial decisions, financial products, and services are the main research terms in this collection of studies. The another cluster identified, coloured in blue, is more concerned with the topics like stock market, individual investors, investment decisions.

4.2.2 Intellectual Structure

For examining the intellectual framework of existing research on financial literacy and investment in financial market, this study uses the historiography and author co-citation network

Author Co-citation Network

Author co-citation network is an efficient technique for determining the intellectual structure of a research domain (Jeong et al., 2014). One novel approach to understand how scientists think is through the use of co-citation analysis. The term "co-citation" refers to the practice of citing two separate pieces of research in one additional scientific research (Small, 1973). Analysis of co-citations requires checking up on group of research articles that are cited together in the scientific work. Clusters of related studies emerge when numerous different authors cite the same sets of papers. These groups of papers that have been referenced together often cover some similar research issue (Culnan, 1987). Co-citation analysis is coupled with single-link clustering and multidimensional scaling methods and hence provides a visual representation of specialised study fields. The clusters so formed by co-citation analysis unveils trends in interdisciplinary research (Surwase et al., 2011). (Fig. 29) shows formation of three clusters. In the first cluster coloured in red, Lusardi, Vanrooij, Brown, Guiso, Campbell, and Klapper are significant authors which are co-cited together in the research field, and it was also found that they are working on financial literacy and its effect on participation in stock market. In the second cluster coloured in blue, Chen, Kim, Huston, Wang, Xiao, and Liu are co-cited together. They being cited together highlights the fact that they are working upon some common topic which was found to be financial education and knowledge. In the third cluster, coloured in green, includes Barber, Grinblatt, Lee, Anderson, Hair which are most commonly cited together.

Historical Direct Citation Network

The most-cited work is used in historiography to first build the historical direct citation network, which is then realised in a chronological sequence (Garfield, 2009). The analysis was performed by identifying seminal works in the field, using the Biblioshiny tool's histNetwork and histPlot functions from the Bibliometrix package. Based on the co-citations network, the most locally cited and pertinent papers in the last five years were mapped and connected and shown in (Fig. 30). Arrows were utilised to show the association between citations among publications as papers were plotted according to the years they were published.

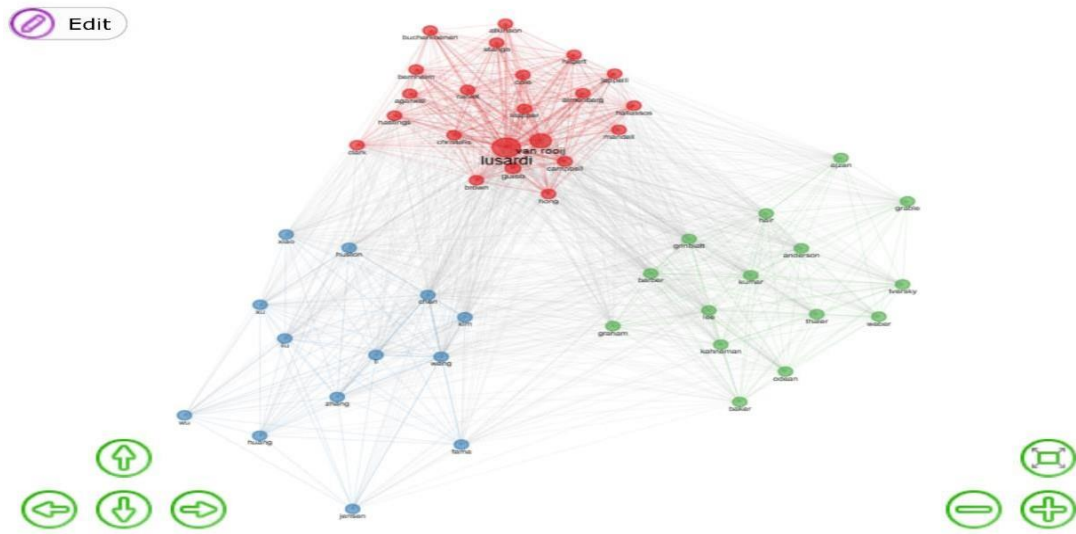


Fig. 29 Author C-citation Network Source : Author' Elaboration using Biblioshiny

Historical Direct Citation Network

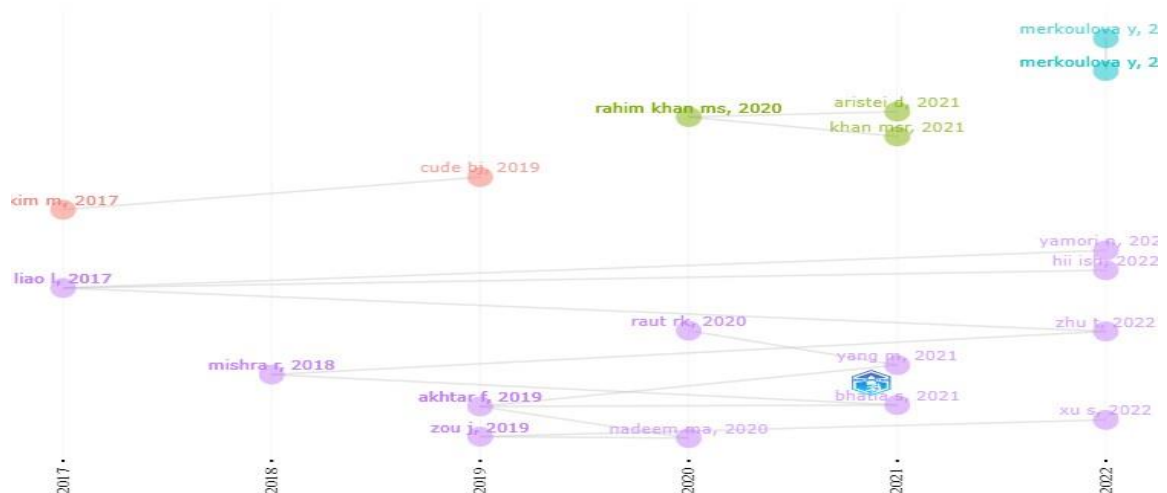


Fig. 30 Historical Direct Citation Network Source : Author' Elaboration using Biblioshiny

**4.2.3 Social Structure
 Collaboration Network of Authors**

The social and professional ties between authors can be traced in a comprehensive and scrupulous manner through co-authorship networks (Newman, 2004). On scrutinising the collaboration network of authors, we can unveil the degree to which research community is dispersed or cohesive, and it assists in identifying the researchers in the network who have the majority of connections with other authors (Kumar, 2015). (Fig. 31) shows 15 clusters with a maximum of 3 authors in a cluster. This illustrates the isolation of the various researchers working on this issue in different parts of the world.

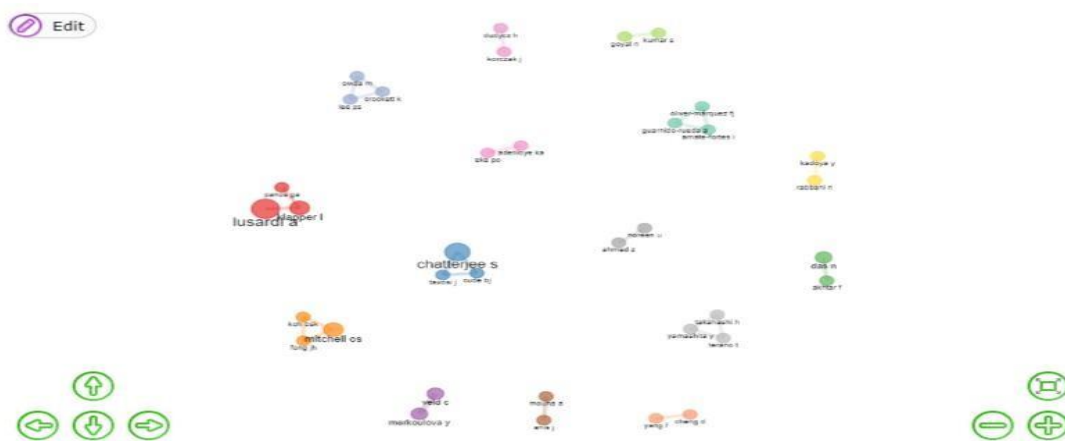


Fig. 31 Author's Collaboration Network Source : Author' Elaboration using Biblioshiny

Country Collaboration Map

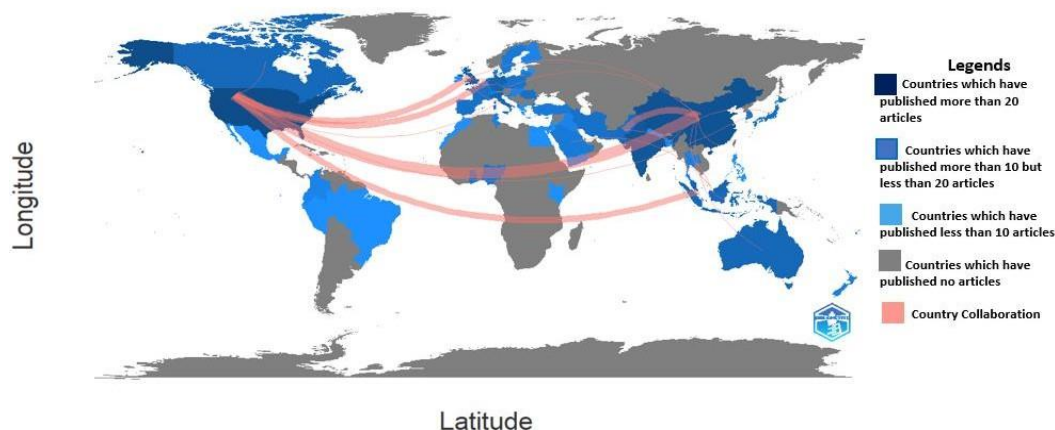


Fig.32 Country Collaboration Network Source : Author' Elaboration using Biblioshiny

The map represented in (Fig.32) shows the countries which are collaborating in the research domain of financial literacy and participation in financial markets. Width of the lines joining the nations shows the number of collaborations among the countries. Thicker the line, greater is the collaboration between countries. The figure shows that most significant collaboration is between United States of America, China, United Kingdom, Singapore.

5 Conclusion

This paper included a bibliometric examination of the researches conducted on financial literacy and involvement in the financial markets. Despite the fact that there is a significant amount of literary work on this topic, we found that there was dearth of bibliometric analysis on this topic. Numerous researchers have used bibliometrics analysis to study financial literacy and its effect on financial behaviour, the effect of financial literacy on retirement planning, and financial literacy itself, but there hasn't been much work done on the association between financial literacy and its effect on the active participation in the financial market. Bibliometric and visualisation methods were used in the current study to analyse the literature on financial literacy and financial market that had been published between 1981 and 2022. 398 documents in total were retrieved from the Scopus database. United States, China, and India had the highest research publications. The highest research-producing organisations in financial literacy and financial market participation were Covenant University of Nigeria and University of Georgia from US. In terms of publications count, the most prolific authors were Y Zhang and A. Lusardi. Sustainability Journal is the most prominent source of research on the topic.

By extensive science mapping, different patterns in scientific publications relating to the topic were recognised, as well as many undiscovered areas, potential future directions, and potential consequences were also highlighted. Financial crimes, financial discussions, Non-macro economic variables, stock market volatility are list of potential future areas of study for researchers. Thematic Evolution revealed the expansion of terms financial literacy and financial market participation within different timespan that how it became a motor theme in last five years as compared to a basic theme in the early stages of research on the topic. The study highlighted the importance of financial education in ameliorating financial literacy, which in turn leads to more active engagement in the financial markets. This research also exemplifies the lack of collaboration among scholars who are tackling this topic from different corners of the world.

6 Limitations and Scope for future Study

The primary shortcoming of the study is that it does not include all of the relevant documents that would need to be analysed. Even though data was gathered through one of the most efficient database -Scopus, which compiles the vast majority of the most notable publications in this field of study, but still there is a possibility that some pertinent studies may not have been included in it. The Author has used various synonyms and components of financial literacy as well as financial market to design the search string to download the data from Scopus database, but may be some other keywords can also be added, which could have modified the search and impacted the results of co-occurrence analysis.

7 Declaration of competing interest

The authors assert explicitly that they have no known financial conflicts of interest or personal affiliations with third parties that could have given the appearance of influencing the work presented in this study.

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