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EXPLORING THE NEXUS OF FINANCIAL LITERACY, BEHAVIORAL FINANCE, AND INVESTMENT DECISIONS: A BIBLIOMETRIC APPROACH

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Abstract

Financial Literacy (FL) and behavioral finance (BF) in the context if investment decision (ID) making is a research phenomenon in the field of business and finance that has gain popularity in the research domain in the last decades. The increasing needs for individual and investors to take daily decision(s) on their investment has increase the popularity of the research domain, most specifically, since the integration of financial literacy to the concept of behavioral finance. But, since the emergence of this research area, there seems to be limited studies to examine the evolution of research of FL and BF in the context of investment decision. Therefore, this study presents a bibliometric overview of FL and BF research on investment decision in the last 19 years (2007-2025). Both performance and science mapping analysis of bibliometric methods were utilized to examined the research domain. Bibliometric indicators of performance analysis used includes; numbers of publications, years of publications, total citations, and total linked strength. Unit analysis for performance analysis includes; evolution analysis, and citation analysis. Unit analysis performed under science mapping includes; authorship analysis, bibliographic coupling, and co-occurrence of keywords analysis. Bibliographic mapping and network visualization were performed through VoSviewer software. Bibliographic data for the analysis were retrieved from the Web of Science database. Limiters were set where necessary for retrieving only relevant data published in the last 19 years. The results of the analysis revealed that, this research concept has experienced significance increase in the last 19 years, and that USA is the most productive and influential country in this aspect of research domain. However, some cognitive bias or illusion theories were identified as a mediating factor associated with investment decision while gender was observed as another distinctive mediator. Also, it essential to consider, however, that research continues to evolve in this research domain, and as a result data continues to change rapidly in the cause of time. Therefore, research present a temporal evolution of the research domain which may change over time.

Keywords - Financial Literacy, Behavioral Finance, Investment Decision-Making, Bibliometric Analysis, Cognitive Biases, Prospect Theory, Investor Behaviour

Introduction

Over the years, the behavior of investors or people when it comes to taking investment decisions has become very foxy (Salim and Khan, 2020). Thus, increasing the relevance and importance of financial literacy among people, while it also has gain popularity among women. This is because of the unstable global financial market and also its financial objectives which continually change. There are an increase entrepreneurs' responsibilities in financial management for the purpose of the financial future. This may be why (Kumar and Anees, 2013) suggested the need for developing a good understanding of the financial world to aid appropriate decision-making on financial objectives in this kind of complex business environment, where the range of complex products that shape the market keeps emerging. The importance of financial literacy and behavioral characteristics in investment decision-making has been underpinned in the literature.

Financial literacy is the ability to take an appreciative and sound financial decision that can drive a financial goal and as well taking care of associated risk factors for every financial decision taken (LUSARDI, MITCHELL, & CURTO, 2010). Lack of this financial knowledge had been the reason why people shy away from taking financial decisions (van Rooij, Lusardi, & Alessie, 2011). But then, the financial decision has to be taken with quite a number of consequences on a daily basis. Decisions on whether to save or invest assets are taken on a daily basis by people (CAMPBELL, 2006) Due to the need to take this decision, people tend to exert a series of financial behavior such as self-control. This financial behavior is said to avert regret and loss haven analyze the factors surrounding the investment. As a result, behavioral finance is vast becoming more popular in this research field, expanding the research area by shedding more light on individual economic and financial investment decisions which correspond to the interaction of behavioral and psychological theories of traditional finance. As explained by (Fromlet,2001), behavioral finance is the interaction of individual behaviour and market behaviour, which combine knowledge of these two theoretical fields in investment decision-making. As this concept becomes more rapidly developing, it coincides with financial literacy, as the individual understanding of finance determines their financial behaviour. National economic growth and development are highly influenced by investment decisions taken either at the individual level, group, or organization. Although, it may be considered difficult to take financial decisions. In taking such a decision, factors including risk, returns, market phenomena, and future amongst other factors need to be considered in the process of taken an investment decision (Baluja, 2016).

Decision-making processes are highly influenced by behavioral finance which shed light on and enhances investors' reasoning, most especially the emotional biases (Singh, 2016). (Ricciardi & Simon, 2000) also mentioned what, why, and how investors make decisions predicted by their financial behaviour. This concept has its origin in sociology, psychology, finance, portfolio selection, and efficient market hypothesis, with psychology and sociology as the main propeller of the concept (Dreman and Berry, 1995). (Singh,2016) emphasizes that the significance of behavioral finance is in the aspect of understanding proper market hypothesis and portfolio selection which are

predictors of decisions taken by investors when viewed from the angle of traditional finance. Although, (Simon, 1979) mentioned that classical finance experts behave rationally while taking investment decisions for good portfolio selection. Their assumption is based on the fact that both the investors and the market are characterized by rational behaviour which facilitates them to take unbiased decisions while considering portfolio selection or securities in order to maximize their financial gain.

However, (Fisher and Statman, 2000) similarly argued that individual or investment decision makers behave in a rational way while taking an investment decision. Judgment and decision-making studies of Kahneman and Tversky show that investors' behaviour is not always in line with the classical model of rational thinking of decision-making in economics but rather a regular assured basis of coherence with sufficient computational ability. This, however, assumes that people's rational behaviour is encapsulated in both cognitive and emotional elements. As explained by traditional financial theory, people or inventors who take financial theory behave in a rational way hence “a rational man”. According to Monitor, (2014), this further explains that investors or decision makers have the capability to quickly understand complex strings and mathematical processes which guide them in conducting contentious instant optimization. The rationality assumption of the traditional finance theory holds to the informational efficiency of the financial market which does hold in reality. Because in reality, investors' behaviour follows thumb rules instead of optimization

Although, Kahenman and Tversky, (1979) and several other scholars have continually opposed the traditional finance opinion of rationality. Multiple behaviours that contradict the traditional finance idea of rationality as been identified and published by several scholars. The new perspective and in-depth publication of new theories by behavioral finance researchers had enhance the research field over the years. This research now looks at the financial market from a new perspective making them to now understand every actor and reacting constraints in the financial market.

Investors' decisions as earlier mentioned, investors decision are predicted by several categories of cognitive illusion. Quite a number of these behaviours are demonstrated in figure 1.

Figure 1: cognitive illusion classification. **Source:** Singh, (2016)

Similarly, Jain et al., (2015 and 2019) as described that in general, the rationality contracting behaviours are embedded in cognitive bias and bounded rationality. They later argued that decisions taken by investors are gleaned from imperfect information. These comprise behaviours such as heuristic-based decisions, procrastination, and unequal weight evidence-based decisions. All these are said to emanate from poor access to complete information. It was because of this deviation as began to take place from the hypothesis of traditional finance reducing its strength in financial investment modules as it does not factor in the significance of human behaviour on investment decisions. This suggestion made by Jain et al is also similar to Chandra, (2016) description of behavioral finance. His study postulated three main themes of behavioral finance. of which includes, heuristics and biases, frame dependence emotion self-attributes, and as well as inefficient markets.

From these main behavioral themes, the study identified eight (8) psychological biases which may impact or determine investors in the process of making decisions. Similar to (Singh, 2016), the study identified; overconfidence bias, representative bias, anchoring bias, availability bias, regret aversion bias, loss aversion bias, mental accounting bias, and herding bias as the cognitive illusion that affect investors' decisions while considering an investment. However, both were the only difference in one identifying prospect theory and the other herding bias. For one to understand the full concept of financial literacy and behaviour finance, understanding these psychological themes becomes very necessary.

Prospect theory for instance assumes that investor behaviour is less concern with prospect gain but rather concerned with prospect losses (Kahneman and Tversky, 1979). In-depth, this theory assumes that investors' or people's choices or decisions on investment are assumed from potential loss or gain that may result from any investment decision taken. The said potential loss or gain is measured by the weight of the decision known as the purchase price. Herding bias theory explains investors' decision to imitate others or groups on a financial decision without considering the rationality of the decision taken (Jain et al., 2019). The process by which individual investors use a cognitive approach to direct and measure financial activities is known as financial accounting bias. This psychological theme assumes that people or investors tend to separate their money or assets into a different account on the basis of the route and intent of its usage. More explicitly, the theory assumes investor treats two elements of their portfolio in a separate manner. The theme is a long theory of behavioral finance formulated by Richard Thaler. Evidence from the separate treatment of different elements of the portfolio may the reason for the unique name given to the theory of "two pockets". According to Thaler, (1999), three of the concepts of mental accounting bias or theory gained popularity. These include; pre and post-benefits analysis, action evaluation of a particular account, and the last one explains the frequency with which accounts are evaluated and the choice of bracketing. This could be on either a daily, weekly, or even yearly basis on broad or narrow terms.

Thaler's concept of mental accounting defiles economic principles as parasitic. When mental accounting bias thus exists, the gain and loss assumption of prospect theory becomes unnecessary. According to the formulator of the theory of behavioral finance Tversky and Kahneman, (1973), loss aversion bias remains a very significant bias assumption. The main focus of the theory is the assumption that individual or investor tends to focus less on capital increment but rather more on preventing capital reduction. People holding this bias theory treat loss as twice as powerful compared to gain. However, regret aversion on the other side is a psychological bias when people or investors feel a sense of regret after taking a certain investment decision, mostly when the outcome seems poor while alternative decisions that could have yielded better results exist. Zeelenberg and Pieters, (2007) refer to it as a theory of comparing emotions resulting in blaming oneself after taking a particular investment decision with regret that an alternative decision could have yielded a better result. This theory measures reaction based on the future situation. Regret bias is a feeling comparing an output of a certain decision with an uncertain choice. Take, for example, consider a choice decision between a known product and an unknown product, people might feel regret finding out that the unknown product performs less good than the already known product hence, investors or people might find it difficult to make a decision of selecting an unknown product. When investors or people fail to admit their wrongs or mistakes is the main cause of this psychological bias. They tend to avoid taking action for their actions leading to the sub-optimal decision. Shefrin and Statmen, (1985) described the disposition theory as the tendency of investors or people to hold a loss on investment for a long time and sell too soon. This kind of bias often occurs when investors face crises, and a short rise in profit on the stock they sell while holding those on loss until

profit. Shefrin and Statman were the first to research this theory and they refer to it as the disposition effect. Their research was aimed at proving earlier findings of Schlarbaum et al., (1978). Their aim was to prove wrong the argument that portfolios of investors contain good stock haven tested in with stock purchase price and sales price of 2,400 investors. Conversely, Shefrin and Statemen argued that Profit or return on stock comes either too large or too small depending on the choice of the stock or investment that produces successful outcomes i.e. dispositional. While those that fail to produce a favourable outcome are left in the investor's portfolio. Hence "dispositional effect". Further research was performed by the due Shefrin and Statman (1985) using an analysis of aggregate mutual fund purchases and redemption. The study found that during a good stock market, more redemption was recorded as opposed to the poor one. All these facts together were combined to back the dispositional effect theory.

The heuristic theory is another cognitive illusion used by investors while considering investment decisions. It is a rule of thumb that neglect the need for a critical solution to the problem. The theory posited that fewer routes, as opposed to complete routes of probability measures, are enough to make decisions on investment, thus nullifying complex calculations of probabilities. Although, Kahneman and Tversky, and other psychologists during that time nullify the thumb rule and other non-rational calculation theories using an approach that incorporate an emotional factor in an organized heuristic bias program. Overconfidence is a consequential theory described by Taylor and Brown, (1988). This is a cognitive bias people tend to have when they have unreal optimism due to some kind of self-enhancing illusion bias. According to DeBondt and Thaler, (1995), people who overestimate their skills, understanding of information, and cognitive capabilities on uncertainty are overconfidence bias. This may the reason why Malmendier and Tate, (2005) argued that overconfident investors tend to encounter investment failure.

A representative bias is another cognitive illusion that interacts when investors take investment decisions. This bias occurs when the brain uses alternative information to meet a certain objective when proper information seems lacking. This could also be explained as investor judgments are not guided by certain underlying features but they prefer to adopt a grounded stereotype. Take, for example, an investor that performs a risk assessment of the house and it future when by comparing the price with another one in the same location. Similar to anchoring bias, investors tend to use past information to set a rigid sale and buying price on shares. This type of bias explains a phenomenon where investors make assumptions based on the original value that is designed to produce a final solution. Another heuristic cognitive bias is availability bias. It's a past experience-based bias. In this bias theory, investors estimate their past experiences and the possibilities of picturing them (Kahneman and Tversky, 1974). There as several other heuristics and cognitive bias theories that affect one decision while considering an investment decision.

In addition, it is important to understand that an investment decision involves a complex process comprising multiple investment alternatives (Salim and Khan, 2020). It requires the utilization of complete information from the different models in taking the most suitable decision that yields self or financial gain. Incompleteness and

inconsistency of traditional finance theory of rationality as led to the vast development of behavioral finance. Ever since there is being a shift and evolution in the research area. This started taking place in 1970 as a result of the development of empirical research in the field of business and finance which considers the importance of psychology, emotions, and cognitive bias that comes into play when taking decisions. However, with (Jain, Walia, & Gupta, 2019) an increase in the emergence of research in this research area, there seems to be little or no research that uses a bibliometric methodology to examine the development and productivity and as well as the emerging concepts of this research area.

Therefore, based on the background provided, this research aimed to complement previous findings by examining the evolution of the literature on mediating role of financial literacy and behavioral finance on investment decision-making using the key bibliometrics procedure described by (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2012a); performance analysis and science mapping analysis. For this aim to be met, references that discussed financial literacy and behavioral finance were retrieved via the web of science (WoS) core collection, and unit analysis including Authors, journals, and countries was applied using the bibliometric procedures. Most particularly, different bibliometric indicators such as citations, publication count, and link strength in the performance analysis while science mapping compliment and climax the analysis. The science mapping includes; co. citation analysis, co-authorship, and co-occurrence of keywords. The method is similar to those (Small, 1973; Callon et al., 1983). The co-occurrence of keywords analysis is a very important unit analysis because it helps in the quantification and visualization of the thematic evolution of financial literacy and behavioral finance research. This study, however, is organized into different flow sections. From methodology to result in the presentation which comprises of performance analysis result and science mapping analysis result. The final section reviews the study's main conclusion.

Section 2
Methodology

Despite the significance of several bibliometric database groups, this research utilized bibliographic records obtained from the web of science (WoS) core collection; a Clarivate analytics. As explained by (Merigo et al., 2015b), WoS is an internationally recognized digital database considered by researchers for its high-quality standard. Also, due to the fact that the database provides the kind of data required for this type of research. In doing this, pre-formed keywords from the context of financial literacy and behavioral finance in investment decision-making were used to retrieve information from the database. This search keyword is formed based on the review of knowledge from the research area that has examined the relationship between financial literacy, behavioral finance, and investment decision-making. Using Boolean operator “OR”, “AND” and commands of quotation, the database was queried using the following keywords; (“Financial literacy” OR “behavioral finance” OR “self-control” OR “mental accounting” OR “regret aversion” OR “loss aversion” OR “prospect theory” OR “heuristic bias” AND “investment decision”).

The search returned 24,300 articles, which was refined to 2,846 considering publication years between 2007 to August 2025. Publications were limited to only the Business and Finance web of science category. Since the emergence of empirical research lay the foundation of the research area (Jein et al., 2019), only original articles as the only document type were considered. While conference papers, reviews, and other grey literature were excluded. The remaining 2,846 were exported into table limited files. Using this bibliographic data retrieved, excel and VoS viewer software were used for carrying out the performance analysis and science mapping.

Section 3

Result and Discussion

3.1 Performance analysis

This section presents performance analysis results based on the bibliometric indicators, including numbers of publications, most influential articles, most productive and influential journals, Most productive and influential authors and countries,

3.1.1 Publications on Financial Literacy and Behavioral finance in investment Decision Research

Figure 2, shows a temporal evolution of publications in financial literacy and behavioral finance in relation to decision-making over time. It is evident from the figure that significant growth has been taking place in this research area over the last 19 years with an exponentially increasing trend. More significant growth was observed in the recent year 2021 while the present year, 2026 is not shown in the figure as a publication for the year may have not been fully published at the time of the data collection. However, the significant growth of this research area can be traced to the increasing numbers of contributions researchers and practitioners aiming at providing an explanation of people's economic behaviour towards financial and investment decisions through the combination of financial literacy, behavioral and psychological theories together (Singh, 2016).

Counts

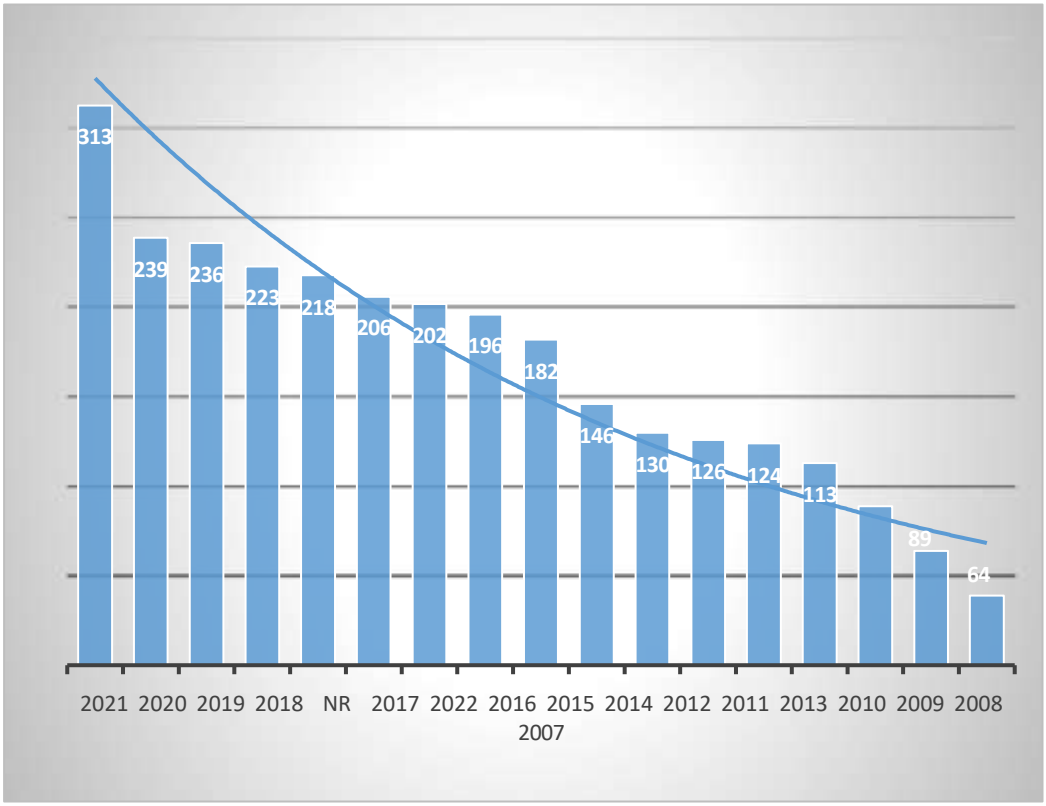

Figure 2: Publication trend

A further breakdown of the temporal evolution of the research area is presented in table 1. To see the development and the emergence of the field in the last 19 years, the years were broken down into three periods. The first period represents the productivity of the research area between 2007 to 2011; the second period represents 2012-2016 while the last period tags the present period containing 6 years (2017-2025) because 2026 seems to still not have been fully built up. The evolution of analysis of this period confirmed an exponential increase in the emergence of research from the first period to the second period to the recent year i.e. publications continue to increase as the period passes by. About half (49.86%) of the publications were published in the last 6 years making the recent period the most productive period in terms of publication. Although, when considering the influence of the period in terms of total citation received. The reverse is the case, as the period goes on the total citation dropped. The first-period account seems to be the most influential period with 23,213 total citations from the 52,819 citations received by all the studies corresponding to 43.95% of the total percentage of citations received for all the years despite having the least number of publications. This may be because publication during this period lay the foundation for a paradigm shift in the research area, most especially a shift from traditional finance theory. Also, the fact that the 7 most influential articles were published during that period. The second period was the next in terms of the most influential period with 32.62% citations followed by the recent period with 21.34%. It is understandable that

publications from the recent period, most especially the last 2 years might not have gained much popularity in the research field when compared to publications from the first and second periods. Also, 218 publications account for the missing information with 0.13% citation.

Table1: Temporal Evolution in the area of Business and Finance
Source: expanded based on Web of Science 2024

Period Evolution	Year	Total Publication	% Publication	Total Citation	% citation
First Period	2007 - 2011	431	15.14	23,213	43.95
Second Period	2012 - 2016	778	27.34	18,285	34.62
Recent Period	2017-2025	1419	49.86	11,254	21.34
Not Reported	-	218	7.66	67	0.13
Total		2846	100%	52819	100%

3.1.2 50 Most Influential Article and Author.

Following (Merigo et al., 2015b) classification method, this section is classified as the most influential article based on the number of citations received. This is to show the growing popularity and influence amass by each article. Evidence from table 2 shows that of the 2846 articles published in the last 19 years, 50 articles were categorized as the most influential haven and received a minimum citation of 134 each. However, shortlisting it to 10 most influential articles, with a minimum number of 300 citations. To my greatest surprise, all of these 10 articles were published in the first period (2007-2011). However, mental accounting and consumer choice are shown to be the most influential articles in the field with a huge volume of 2588 citations. This article seems to be the first to explain in detail how both cognitive psychology and microeconomics moderate consumer behaviour. With an emphasis on how profit and loss through value function theory are products of mental coding. Also, the articles explain the new concept of investment and purchase known as transaction utility explaining the governing principles behind considering investment decisions. This could explain the reason for its influence on other articles. The second most influential article is also one with a total citation of 1204 and was published in 2010, two years after the most influential. This article demonstrated the “impact of online consumer reviews sales: the moderating role of product and consumer characteristics.”. The emphasis of the study was on how the characteristics of the investment determine the characteristics of choice of the investor i.e. the consumer. Research on how “construal levels and psychological distance affect representation, evaluation and behaviour” is the third most influential article with 772 total citations. The influence of the articles was around its claims on how thoughts and behaviour of people over a choice of

investment is influenced by construal level theory; a corresponding account of psychological distance. An article that explains an overview of financial literacy around the world and another one that discusses spent resources and how having self-regulatory resources moderates impulse buying. Both have received 516 and 499 total citations respectively.

Also, it is important to note that the authors responsible for the most influential articles were the most influential author based on the number of citations the articles have received. Thaler, 2008, Zhu et al., 2010, Trope et al.,2007, and Gino et al., 2011 were the most influential authors. It also important to note that influence in the bibliometric indicator is measured by the number of citations. The comprehensive list is shown in Table 2

3.1.3 35 Most Productive Author

Author productivity is another unit analysis of bibliometric performance analysis. It measures the productivity of the authors based on the total number of articles published over time. As demonstrated in table 3, it was revealed that 35 authors have published a minimum of 6 articles in the last 19 years. However, of these 35 authors, 5 authors were considered as the most productive with 10 minimum articles published. Haws, Kelly L. is the most productive author and has contributed to the development of the research field with 22 publications. Following Kelly, are Ponsit J., Michael S.J., Pattanaporn C., and Meir S., with 12, 11, 10, and 10 publications respectively. Other notable authors are Robert D.B., Rangan G., Russell J.E., Annamaria N., and Chi Y.K. with 9 articles each in the research field.

3.1.4 Most productive and Influential journal

Journal also known as source productivity analysis is presented in table 4. In this table, 45 journals were identified as the most productive source, and have contributed to at least 10 publications. The categorizations were based on a number of publications. Interestingly, the Journal of Behavioral Finance is the most productive source with the highest number of publications 462. When considering its influence on the development of financial literacy and the Behavioral finance field, this journal emerges to be the second most influential journal behind a journal of consumer research haven received 3450 citations which is the highest citation when compared to other sources. The productivity and influence exerted by these sources are because of their relationship with the review topic. As expected, the journal of behavioral finance is mainly for publications that discuss concept of finance and psychological behaviour. And since this research examined how financial literacy and behavioral finance affect investment decisions, it concepts is expected to have much of their source around finance and business psychological journals. Supporting these, it was observed from the productivity analysis that the majority of the 45 categorized journals as most productive are journals of business, finance, and psychology. Review of behavioral finance and Journal of consumer research were the second and third most productive sources with 254 and 106 articles respectively. Other notable sources in terms of productivity were

the Journal of behavioral & experimental finance, management science, Journal of marketing research, and Journal of banking and finance with a minimum of 50 publications in the last 16 years. Moreover, when it comes to influencing, the Journal of consumer research is the most influential journal with 6,361 citations. This is probably because investment decisions are better explained using the consumer perspective. Also, the fact that the 5th most influential article and some other influential articles were published in this journal. Journal of behavioral finance emerge as the second most influential source with 3450 citations. Other notable influential sources are marketing science, journal of financial economics, organizational behaviour and human decision prepossesses, journal of applied psychology, journal of marketing research, and marketing science, with all have received over 2000 citations. It was evident that most of these source house the most influential articles. Marketing science for instance house the most influential article with the highest numbers of citation.

3.1.5 Most productive and Influential country

This unit analysis shows the contribution of the country to the evolution of financial literacy and Behavioral finance in relation to investment decisions. As demonstrated in table 5, the United States shows to be the most productive and influential country have contributed to the publication of 1,218 corresponding to 42.79% of the total included studies in this research. All of the 1,218 articles have received a total of 36007 citations corresponding to over 68% of the total citations received by all the included documents. China is the second most productive and influential contributor, with 307 articles that have received 6,269 citations. Other notable countries in the productivity of this research field are England, Germany Australia, India, Canada, and France contributed to over 100 articles in the last 16 years. However, apart from US and China, Canada, England, Germany, Australia, Netherlands, and France were next to the duo in terms of influence with each country receiving over 2000 citations. The analysis shows that India remains the 13th most influential country with over 1000 citations received.

3.2 Science mapping

The previous section presents a fair understanding of the performance analysis of the research in financial literacy and Behavioral finance in relation to the investment decision. However, science mapping analysis is presented to further illuminate and complement the previous analysis. Not just these, but also to structurally visualize the key area of the research (Cancino et al., 2017). Using science mapping, the main publications are identified for analysis of structural visualization and connection of the key actors in the research area (Martinez-Lopez et al., 2018). To perform this analysis, co-authorship, co-citation, and co-occurrence of keywords techniques were utilized as demonstrated by (Wang et al., 2018). Following (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2012b), co-authorship and co-citations are analyzed based on authors and country references. Hence, co-authorship and co-citation of the country network/ map are presented in this section. Alongside these, is the network analysis of keywords co-occurrence. It is very important to note that, the frequency to which an author or country is cited is denoted by the size of the node while the frequency of co-occurrence is denoted by the thickness of the lines. Also, the position or distance of

nodes to another node shows the close relationships of the authors, country, and keywords. Indicators belonging to the same color categories represent the clusters. Ans it is also important to know that, cluster categorization is based on the close relationship of the indicators.

3.2.1 Co-Authorship Analysis

This unit analysis demonstrates the social network and relationship between authors in the research field. It is important to note that authors are denoted by the nodes while the network lines show the social collaboration between the author. Meaning that authors who have jointly published their research findings will be connected via the lines. The co-authorship analysis identified 5,729 authors from all the included references, however, of these identified authors, only 271 authors are strongly connected as shown in figure 3. These strongly connected author were categorized into 26 clusters denoted by different colours. Kelly H.L in cluster 17 represents the largest co-authorship connection with 42 total link strengths. The author has jointly with about 30 other authors to produce 22 research articles. Another notable author in the authorship collaboration is Gavan F.J. with 20 total linked strengths. The Author has a connection with about 19 authors including Kelly in different clusters to produce 7 documents. A very strong authorship connection was observed between Pierre C., the main author in the first cluster (red), and Kelly that has the highest collaboration, Brain W., in cluster 7, Peggy L.J., in cluster 10, and 15 other authors to produce 4 documents. From the figure, it was deduced that a strong relationship is yet to be developed between the researchers on the concept of financial literacy and Behavioral finance in relation to an investment decision, with the network map showing a fragmented relationship.

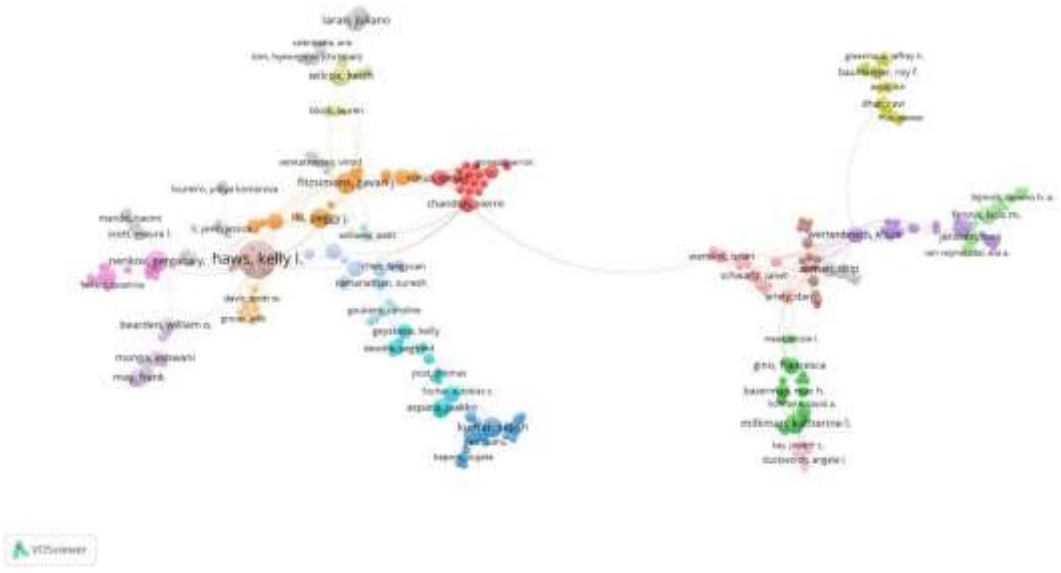

Figure 3: Co-authorship Map/Network

3.2.2 Co-countryship Analysis

This analysis shows the relationship between countries in terms of research collaboration in this sphere. The analysis shows that 95 countries have been dedicated to the research of financial literacy and behavioral finance in relation to the investment decision. Of these countries, 82 countries seem to have a strong relationship when measured in terms of joint publications. The network map shows that 17 categorical relationships (17 clusters) exist between these countries and are differentiated with colors (figure 4). In these country network analyses, it was evident that the United States takes the central stage when it comes to collaborations with other countries on these research phenomena. This was evident from the size of the note and a total linked strength of 533. The US has jointly collaborated with 56 different countries of the 95 total countries to produce 1, 218 research on this concept of investment decision. China was seen next in terms of total linked strength and country collaboration, haven shown connections with 32 different countries including the US, German, England, Australia, India, France, Netherland, South Korea, Singapore, Tiwan, and others. China has jointly produced 307 documents with 247 total linked strengths. One interesting thing is that England had more country collaboration compared to China. Networks map shows that England had published 209 documents in collaboration with 44 countries and a total linked strength of 216 lower than china. Other notable countries with high collaboration with other countries are France with 34 connections and 101 documents, Germany with 32 connections and 167 documents, Netherland with 30 connections, and 89 documents, Australia with 29 connections and 189 documents, and India with 17 connections and 146 documents. One important thing to note is that the largest set of collaborations is between 8 countries including the US, China, England, France, Germany, Netherland, Australia, and India.

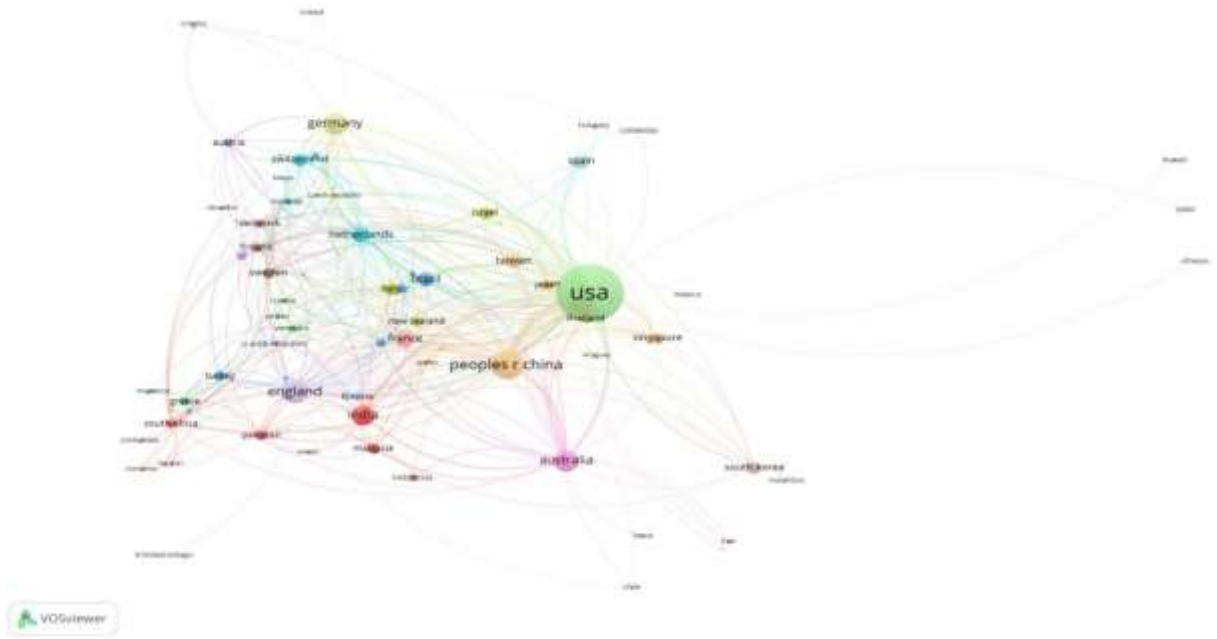

Figure 4: Co-country ship Network ma

3.2.3 Bibliographic Coupling

This unit analysis represents a more complex citation count, and it occurs mostly when two authors or sources commonly cite the same author or source (Kessler, 1963a). A bibliographic coupling according to (Small, 1973) and (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2012) measures similarity between author, source, or documents. The importance of this unit analysis is to further present a retrospective analysis as opposed to prospective information provided by citation analysis which is temporal. Therefore, figure 5 presents the bibliographic coupling of author. It was shown from the figure that, less similarity exists among authors in this research area, with the network split into clusters. Of the 6 clusters identified by the coupling mapping, 4 (Red, Green, blue and yellow) were the clusters with similarities when examining the minimum of similarity in 2 articles. Strong similarities were seen between Russell J.E and other authors in yellow clusters with authors in a blue cluster containing Kelly as the most dominant author. The coupling analysis shows that the research on financial literacy and behavioral finance in relationship with investment decisions was mainly researched under four clusters of authors. Although, three clusters of sources were identified for bibliographic coupling of sources indicated with green, red, and blue (figure 6). Evidence from the size of the nodes shows that the Journal of behavioral finance in the green cluster, the journal of financial economics in the blue, management science in the blue cluster, the journal of consumer research in the red cluster, journal of business research in red, journal of marketing red, and journal of applied psychology also in the red cluster were the significant source for publication similarities in a minimum of 5 articles.

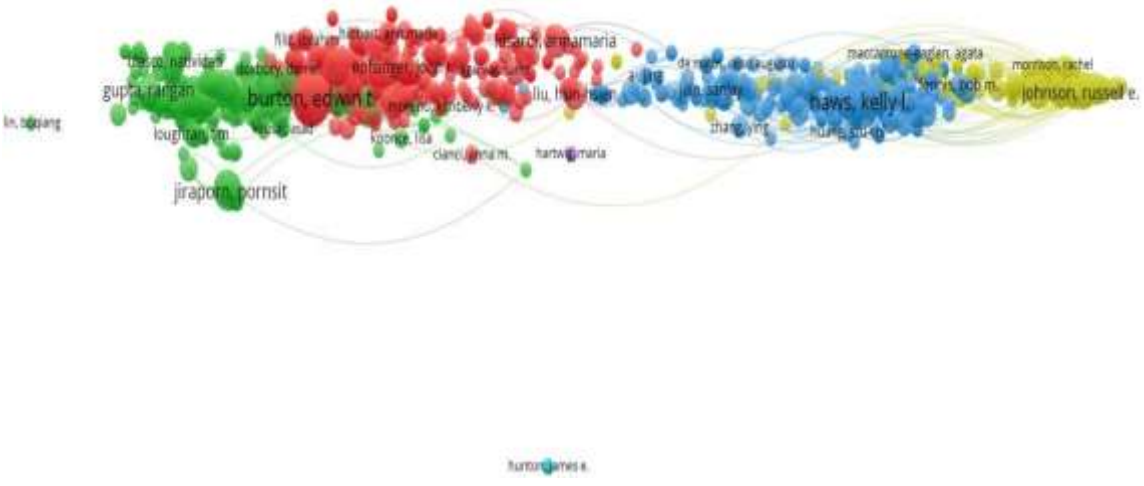

Figure 5: Bibliographic coupling map of author

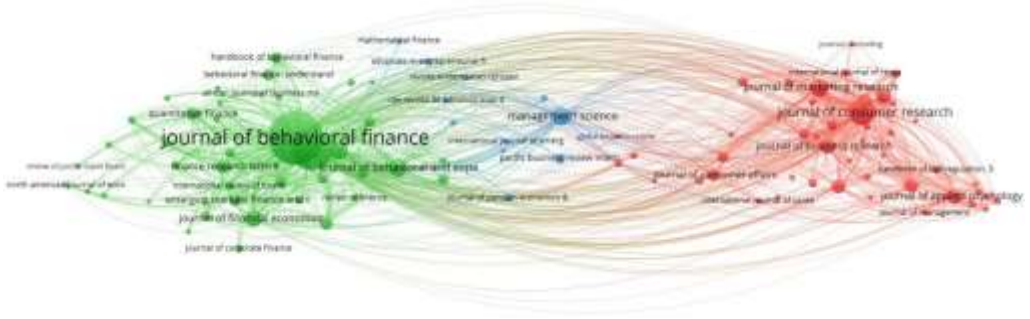

Figure 6: Bibliographic coupling map of source

3.2.4 Co-occurrence of Keywords

The co-occurrence of keywords is another interesting analysis. This analysis using keywords aims to illuminate the conceptual structure of the research area (Callon et al., 1983). This network analysis present co-occurrence of keywords for all 16 years to see the significant keywords that have been explored in the sampled years (figure 7). The co-occurrence analysis identified 9,469 keywords on which the foundation and concept of this research are built. All of these keywords have as a minimum usage of 5 occurrences. Furthermore, as shown in the figure, all of the keywords were categorized into 8 clusters mapped with different colours. The clustering was based on the closeness in terms of how they have been occurring. Out of the 8 clusters identified, 5 seem to be the mostly used clusters of keywords. These 5 clusters were nodes painted in Red, Green, Purple, Blue, and light blue. In each cluster, co-occurrence differs. For instance, in the red cluster, self-control has the co-occurrence frequency with 669 occurrences and has co-occurred with another keyword 633 times. Other most notable keywords in this group are behaviour, decision-making, consumption, mental accounting, choice, preference, consequence, time, and consumer choice. Three keywords including performance, personality, model, ego-depletion, self-regulation, and strength-model were the most concurring keywords in blue clusters. In a light blue cluster, Prospect theory occurs 159 times and 359 linkages with other keywords. Following this keyword in this cluster is overconfidence with 149 occurrences and 356 linkages. Psychology is also in this group with 104 occurrences and 345 links. The decision is another notable keyword in that cluster with 124 occurrences and 382 connections with other keywords. Other keywords in this group with high occurrence and links are loss aversion, Uncertainty, Portfolio choice, and individual investment. Going to the green cluster, Behavioral finance is the most occurrence keyword with 567 occurrences and 595 connections with other keywords. In the same groups are risk, stock return, returns, impact, information, cross-section, momentum, investor sentiment, liquidity, volatility, herding, impact, asset pricing, earnings, anomalies, overreaction, markets, and

equilibrium. Financial literacy was the most frequently occurring word in the purple cluster with 126 occurrences and 278 connections with other keywords. In this same cluster, there exist, fragments of literacy, knowledge, financial knowledge, education, gender difference, gender, determinants, risk taking, debt, expectation, aversion, and wealth.

Overall, Self-control, Behavioral finance, behaviour, risk, performance, information, return, choice, and impact were the most occurring keywords in this concept of research. However, the high occurrence of self-control and behavioral finance may be explained that the latter holds the shift from traditional finance theory to this day's behaviour of investment choice. As identified in the literature, Self-control is one of the prospective behavioral financial characteristics of people which impact their choice in the process of taking investment decisions through the moderating role of financial literacy. Self-control as a characteristic of investors shows a connection with other keywords indicating that its psychological personality traits which correspond to ego-depletion. In this sense, the level of information, education, knowledge, and as well as gender plays role in their risk-taking when it comes to investment decisions. The connection between behavioral finance and investment decision and portfolio selection was seen to feature some of the cognitive bias theories including prospect theory, overconfidence, and risk aversion. The relations also identified the concept of gender and financial literacy. Mental accounting cognitive illusion has a connection with prospect theory,

loss aversion, risk, decision, choice, and consumption. Keywords analysis also shows that investment decisions also have a strong relationship with investors' choices which is a kind of psychological behaviour. Uncertainty and volatility on investment return was another keyword connection observed to affect the choice of investment decision. Risk aversion and loss aversion were just cognitive characteristics of behavioral finance. It was also observed that gender differences may differ when it comes to financial literacy and are determinants of self-control. A strong connection was seen between financial literacy, gender, literacy, education, knowledge, overconfidence, wealth, self-control, and behavioral finance over investment decisions.

The distinct observation of gender of this analysis on how gender gap exists in the process of investment decision. These observations correspond to several authors' positions in the literature that risk-taking differs with gender and also that financial literacy all over the world differs with gender. Although, the network analysis does not identify any support for either of gender. Another interesting observation of this research was that the concept of financial literacy starts in the last few years with an increase in research on the concept in the recent year. Keywords emergence with respect to a year were shown in figure 8 as yellow nodes. Alongside the emergence of financial literacy are investment attention and herding behavioural. This research also identified emergent myopic loss aversion, cognitive reflections and financial advice as the new keywords in the research field.

3.3 Limitation

Despite the significance of this research, it encounters some limitations. One of which

is the consideration of only original articles. It is believed that, that several other document types other than article alone could have contained relevant information. Although, setting restriction to only original articles was based on the fact that it contains primary data other than secondary data used by another document type. And in so doing, it increases the validity of this research. In addition, publications other than English papers were excluded, which may be biased toward non-English authors and references. Although, this limitation was set to reduce the difficulties associated with non-English studies.

3.4 Conclusion

This present study presents a deep overview of Financial Literacy and behavioural finance in relation to investment decisions. This research uses a bibliometric analysis methodology to examine the evolution of research and the emerging concept of investment decisions in the body of knowledge. Using performance analysis and the science mapping method of bibliometrics, this study has been able to contribute to the body of knowledge by establishing a theoretical-based knowledge of how the research concept has developed over time. As well as the identification of key actors including the author, journal, and country in this research area. However, the study also identifies the network connections that exist between Financial Literacy and Behavioural Finance in the concept of investment decision-making. Self-control, mental accounting, loss aversion, regret aversion, risk aversion, prospect theory, overconfidence, uncertainty, returns, personality, self-regulation, consumer choice, and preference were all the most occurring behavioural characteristics associated with investment decisions. However, it was revealed that financial literacy and investment decision is a new concept that is becoming increasingly researched in the last 3 years. The emphasis in terms of its network connection lies on self-control, behavioural finance, literacy, education, over-confidence, and most distinctively identification of the gender gap and its association with an investment decision. The emergence of new keywords was also observed, and it includes, myopic loss aversion, cognitive reflections, and financial advice. On the actors, the study found the USA, China, England, Germany, France, Netherlands, Australia, and India as the most productive actors in the field. This research phenomenon was most popular among business, finance, and psychological journals. In general, this present literature has shown that the concept of financial literacy and behavioural finance relationship with investment decisions have experienced increasing popularity in more recent years, with the field changing trends and research focus since 2018. The finding of this study is not only important in the academic sphere but also significant in the practical world as everyone tends to take certain investment decisions on a daily basis.

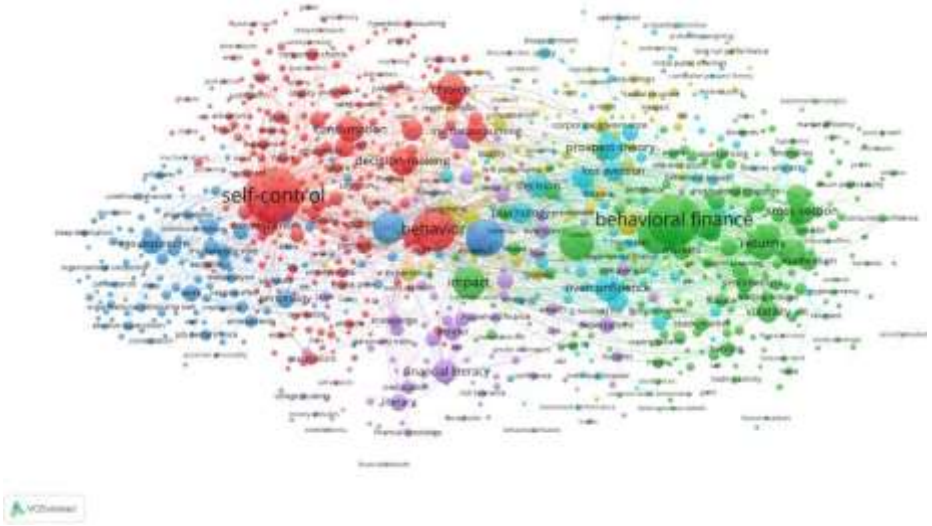

Figure 7: Co-occurrence of keywords network

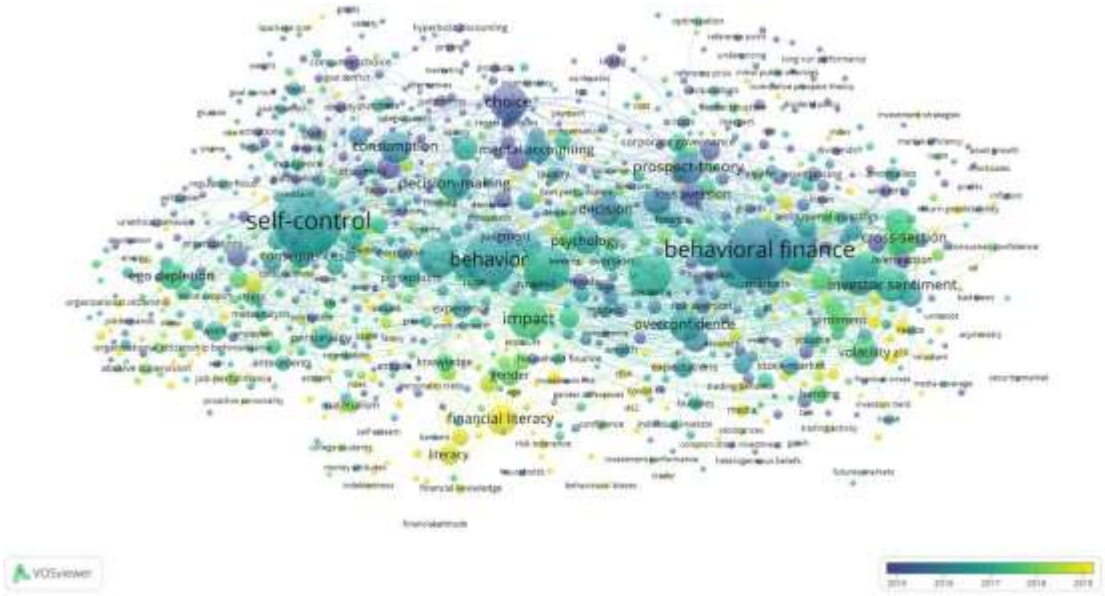

Figure 8: Co-occurrence of keywords network (Year occurrence)

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