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Linkages between Financial Risk and Sustainability in the Banking Sector: A Bibliometric Study

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ABSTRACT

This paper presents a bibliometric analysis examining the evolution of research within the sustainability and risk management sectors in banking, based on several visual network analyses. Initial findings delineate thematic clusters focusing on green banking, financial performance, and the impact of technological advancements such as fintech. An investigation into the temporal progression of research themes from 2017 to 2021 highlights a significant shift from foundational concerns about financial stability to more nuanced discussions integrating sustainability and economic inclusivity. Additionally, the research identifies potential gaps in the literature, particularly around the integration of Islamic banking with green practices and the management of environmental and climate-related risks. Analysis of author collaborations within these thematic areas reveals a robust network of scholars, characterized by both dense, focused groupings and broader, interdisciplinary linkages. This study underscores the dynamic and evolving nature of academic discourse in sustainable finance, suggesting promising areas for future research.

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1. INTRODUCTION

In recent years, the banking sector has undergone significant transformations, largely driven by increasing awareness and integration of sustainability practices [1]. The financial crisis of 2008 was a pivotal moment that underscored the vulnerability of the banking sector to financial risks and highlighted the need for a more resilient and sustainable financial system [2]. In response, banks and financial institutions around the world have been increasingly incorporating environmental, social, and governance (ESG) criteria into their risk management frameworks [3], [4]. This shift towards sustainability is not only a response to regulatory pressures but also a strategic move to mitigate risks and capitalize on new opportunities in the evolving market landscape [3].

Sustainability in the banking sector encompasses a broad range of practices aimed at promoting long-term environmental stewardship, social responsibility, and economic stability [5]. These practices include green financing, sustainable investment strategies, and the integration of ESG criteria into lending and investment decisions [6], [7]. The adoption of these practices is driven by the recognition that sustainable banking can lead to enhanced financial performance, improved risk management, and greater stakeholder trust [8]. As a result, there has been a growing body of literature exploring the linkages between financial risk and sustainability in the banking sector, reflecting the increasing importance of this area in both academic and professional circles [9].

The intersection of financial risk and sustainability is complex and multifaceted, involving various dimensions such as credit risk, market risk, operational risk, and reputational risk [10], [11]. For instance, banks that engage in unsustainable lending practices may face higher credit risks due to the potential for borrower defaults arising from environmental or social challenges [12]. Similarly, banks that fail to adopt sustainable practices may face reputational risks, which can adversely affect their market standing and financial performance [13]. Understanding these linkages is crucial for developing effective risk management strategies that align with sustainability goals and contribute to the overall stability of the financial system.

Bibliometric studies provide valuable insights into the evolution and trends in research on financial risk and sustainability in the banking sector [14]. By analyzing the patterns of scholarly publications, citations, and collaborations, bibliometric analysis can reveal the key themes, influential works, and emerging areas of interest in this field [15]. Such studies not only enhance our understanding of the current state of research but also identify gaps and future directions for further investigation [16]. In this context, the present study aims to conduct a comprehensive bibliometric analysis to explore the linkages between financial risk and sustainability in the banking sector.

Despite the growing recognition of the importance of sustainability in mitigating financial risks, there is still a lack of comprehensive understanding of how these concepts are interrelated within the banking sector. The existing literature on financial risk and sustainability is fragmented, with studies often focusing on specific aspects or isolated case studies. There is a need for a holistic analysis that integrates the various dimensions of financial risk and sustainability to provide a clearer picture of their linkages and implications. Furthermore, the rapid evolution of the banking sector in response to global challenges such as climate change, technological advancements, and regulatory changes necessitates an updated and in-depth examination of the current research landscape. Addressing this research gap is essential for developing effective strategies that enhance the resilience and sustainability of the banking sector.

The primary objective of this research is to conduct a bibliometric analysis to explore the linkages between financial risk and sustainability in the banking sector. Specifically, the study aims to:

1. Identify the key themes and trends in the research on financial risk and sustainability in the banking sector.
2. Analyze the patterns of scholarly publications, citations, and collaborations in this field.
3. Highlight the influential works and leading researchers contributing to the understanding of financial risk and sustainability.
4. Identify gaps in the existing literature and suggest future research directions.

By achieving these objectives, the study seeks to provide a comprehensive overview of the current state of research on financial risk and sustainability in the banking sector and contribute to the development of more effective risk management strategies that align with sustainability goals.

2. LITERATURE REVIEW

2.1 *Conceptual Framework of Financial Risk and Sustainability in Banking*

The literature on financial risk and sustainability in the banking sector is diverse, encompassing various perspectives and approaches. Financial risk in the banking sector traditionally includes credit risk, market risk, operational risk, and liquidity risk. These risks can arise from various sources, such as macroeconomic changes, borrower defaults, market volatility, and operational failures. On the other hand, sustainability in banking involves integrating environmental, social, and governance (ESG) criteria into financial practices to promote long-term stability and ethical standards.

Sustainability in banking has gained prominence due to the increasing awareness of climate change, social inequality, and corporate governance issues. Banks are now seen as pivotal players in promoting sustainability through their lending and investment practices. By incorporating ESG criteria into their risk management frameworks, banks can mitigate risks associated with unsustainable practices and enhance their resilience to environmental and social shocks. This integration is often referred to as sustainable banking or green banking.

2.2 *Evolution of Research on Financial Risk and Sustainability*

The evolution of research on financial risk and sustainability can be traced back to the early 2000s when the concept of sustainability started gaining traction in the financial sector. The initial focus was on environmental risks and their impact on financial performance. Studies by scholars such as [17] and [18] explored how environmental risks could affect credit risk and loan performance. These early studies highlighted the need for banks to consider environmental factors in their risk assessments.

As the concept of sustainability broadened to include social and governance aspects, the research focus expanded accordingly. Studies began to examine the impact of social and governance risks on financial performance. For instance, [19] conducted a meta-analysis of over 2,000 empirical studies and found that ESG criteria had a positive impact on corporate financial performance. This finding underscored the importance of integrating all three ESG dimensions into banking practices.

In recent years, the focus has shifted towards understanding the holistic impact of sustainability on financial risk. Scholars have started to explore the interconnectedness of different types of risks and how they are influenced by sustainability practices. For example, [20] proposed a comprehensive framework for integrating ESG risks into traditional risk management models. Their work highlighted the need for a systemic approach to risk management that considers the interdependencies between different types of risks.

3. METHODS

This study employs a bibliometric analysis to explore the linkages between financial risk and sustainability in the banking sector. The methodology involves several key steps. First, relevant literature will be identified and collected from Google Scholar, using keywords related to financial risk, sustainability, ESG criteria, and banking. The search will focus on peer-reviewed journal articles, conference papers, and significant reports published between 1996 and 2024 to ensure a comprehensive and up-to-date dataset. Next, the collected literature will be analyzed using VOSviewer to map the research landscape, identify key themes, influential works, and leading researchers in the field. Co-citation analysis, keyword co-occurrence analysis, and network visualization techniques will be applied to reveal patterns of collaboration, research trends, and emerging areas of interest. Additionally, content analysis will be performed to provide qualitative insights into the main findings and theoretical frameworks used in the selected studies. This mixed-method approach will offer a robust and detailed understanding of the current state of research on financial risk and sustainability in the banking sector.

4. RESULTS AND DISCUSSION

4.1 Research Data Metrics

Table 1. Data Citation Metrics

Publication years	1996-2024
Citation years	28 (1996-2024)
Paper	980
Citations	54961
Cites/year	1962.89
Cites/paper	56.08
Cites/author	27672.83
Papers/author	519.66
Author/paper	2.46
h-index	125
g-index	205
hI,norm	82
hI,annual	2.93
hA-index	53
Papers with ACC	: 1,2,5,10,20:809,678,459,290,161

Source: Publish or Perish Output, 2024

The data citation metrics presented in Table 1 offer a comprehensive overview of the publication and citation trends in the research on financial risk and sustainability in the banking sector from 1996 to 2024. Over these 28 years, a substantial body of work has been developed, totaling 980 papers. These papers have collectively garnered 54,961 citations, reflecting the significant impact and relevance of this research area. The average number of citations per year stands at 1,962.89, indicating a consistent interest and engagement in this topic within the academic community. Furthermore, with an average of 56.08 citations per paper, it is evident that the research outputs in this field are highly regarded and widely referenced by scholars and practitioners alike.

The citation metrics also reveal insights into the productivity and influence of authors contributing to this field. The average number of citations per author is notably high at 27,672.83, suggesting that the authors are well-cited and have made substantial contributions to the literature. On average, each author has published approximately 519.66 papers, which indicates a high level of academic productivity. The metric of 2.46 authors per paper suggests a collaborative research environment, where multiple authors frequently co-author papers, enhancing the quality and depth of the research through diverse expertise and perspectives.

The various h-indices and related metrics further illustrate the scholarly impact and quality of the research. The h-index of 125 indicates that at least 125 papers have received 125 citations or more, highlighting the depth of influential research in this area. The g-index of 205 further emphasizes the high citation counts of the top publications. The normalized h-index (hI,norm) of 82 and the annual h-index (hI,annual) of 2.93 demonstrate the sustained influence and consistent citation of the authors' works over time. The hA-index of 53, which accounts for the average number of citations of the most frequently cited articles, underscores the significant scholarly impact of this research field. Additionally, the presence of high citation counts for specific papers (1, 2, 5, 10, and 20) indicates the existence of seminal works that have shaped and guided subsequent research in financial risk and sustainability in banking.

Table 2. Top Cited Research

Citations	Authors and year	Title
1222	[21]	Corporate governance and corporate social responsibility disclosure: Evidence from the US banking sector
959	[22]	A climate stress-test of the financial system
801	[22]	Is sustainability reporting (ESG) associated with performance? Evidence from the European banking sector
774	[23]	Corporate social responsibility in the international banking industry
761	[24]	Sustainable finance and banking: The financial sector and the future of the planet
714	[25]	Climate change challenges for central banks and financial regulators
681	[26]	The service quality dimensions that affect customer satisfaction in the Jordanian banking sector
651	[27]	Corporate social reporting and board representation: evidence from the Kenyan banking sector
596	[28]	Conflict translates environmental and social risk into business costs
558	[29]	The determinants of bank profitability: empirical evidence from European banking sector

Source: Publish or Perish Output, 2024

Table 2 showcases the top ten most cited research papers in the field of financial risk and sustainability in the banking sector, highlighting influential works that have significantly contributed to the academic discourse. The most cited paper, authored by Jizi et al. (2014) with 1,222 citations, explores the relationship between corporate governance and corporate social responsibility (CSR) disclosure in the US banking sector. This high citation count underscores the importance of governance structures in driving CSR practices and transparency within banks, reflecting a critical intersection of governance, ethics, and sustainability that resonates widely in academic and professional circles.

The second most cited paper by Battiston et al. (2017), with 959 citations, conducts a climate stress-test of the financial system, highlighting the systemic risks posed by climate change. This study's substantial citation count illustrates the growing recognition of climate risk as a fundamental factor affecting financial stability. The paper's impact is further reinforced by the subsequent research it has inspired, demonstrating the urgency and relevance of incorporating climate risk assessments into financial regulatory frameworks. This focus on climate risk is further evidenced by the high citation counts of related works, such as the 714 citations for Campiglio et al. (2018), which discusses the challenges climate change poses for central banks and financial regulators.

Other highly cited papers, such as Buallay (2019) with 801 citations and Scholtens (2009) with 774 citations, delve into sustainability reporting (ESG) and corporate social responsibility in the banking sector, respectively. Buallay's study provides empirical evidence linking ESG practices to performance in the European banking sector, suggesting that sustainability reporting can enhance financial outcomes. Scholtens' research emphasizes the role of CSR in the international banking industry, indicating that socially responsible practices are integral to sustainable finance. These studies collectively highlight the pivotal role of ESG and CSR in shaping sustainable banking practices, driving both academic inquiry and practical implementation. The prominence of these papers, alongside works on service quality dimensions (Pakurár et al., 2019) and the determinants of bank profitability (Menicucci & Paolucci, 2016), underscores the multifaceted nature of research in this field, spanning governance, environmental risk, performance metrics, and customer satisfaction.

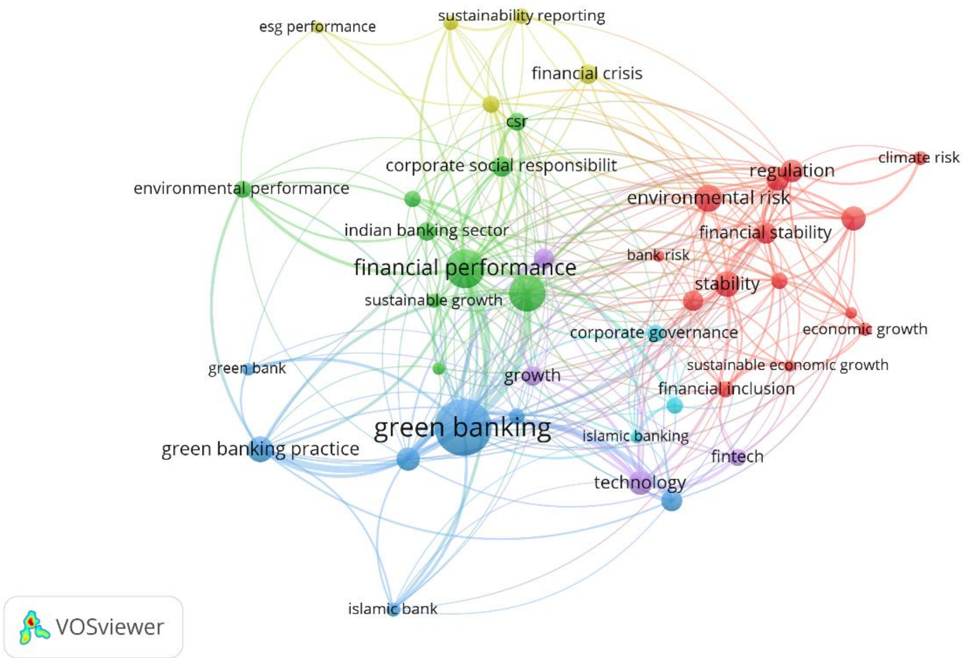

Figure 1. Network Visualization

Source: Data Analysis Result, 2024

The figure 1 is a bibliometric network analysis focused on the interrelationships between financial risk and sustainability within the banking sector. This type of visualization maps key concepts based on their frequency and interconnections in academic literature. The diagram is structured into clusters of related terms, each distinguished by a unique color, indicating thematic groupings that reveal the focal areas of current research and discussion.

The green cluster in the diagram predominantly focuses on "financial performance" and is closely related to environmental performance, sustainable growth, and green banking practices. This cluster's prominence suggests a robust discourse on how sustainability initiatives within banking are not only part of corporate social responsibility but also contribute to the financial performance of these institutions. The strong connections within this cluster highlight an ongoing shift towards more environmentally focused banking practices that integrate sustainability into core business strategies. Conversely, the red cluster centers around "financial stability," featuring closely related concepts such as regulation, economic growth, and financial inclusion. The dense interconnections here underscore the critical importance of maintaining stability in the financial system, with a particular emphasis on how regulatory frameworks influence both stability and the potential for economic growth within the sector. This cluster suggests that stability and risk management remain paramount, with regulatory practices playing a pivotal role in shaping the operational landscape of banking. The blue and purple cluster illuminates the role of technology in the banking sector, particularly highlighting "green banking" ,"Islamic bank", “fintech”, “technology”. This area of the diagram indicates a significant intersection between technological innovations and their applications in specific banking practices, such as in Islamic finance. It suggests that technological advancements are not only reshaping traditional banking mechanisms but are also critical in developing new financial products and services that align with ethical and religious guidelines.

Inter-cluster connections provide further insights. For instance, the link between environmental performance in the green cluster and financial performance in the red cluster points to an increasing recognition of the financial value of sustainable practices. Such connections imply that sustainability and financial risk management are becoming increasingly intertwined, with banks recognizing that green practices can also mitigate financial risks and enhance stability. Regulatory frameworks also emerge as a central theme, particularly in their role as mediators between sustainability goals and risk management objectives. The diagram highlights the necessity for policies that support sustainable development without compromising financial stability, suggesting a growing area of focus on creating regulatory environments that encourage innovation in sustainability while ensuring economic safety.

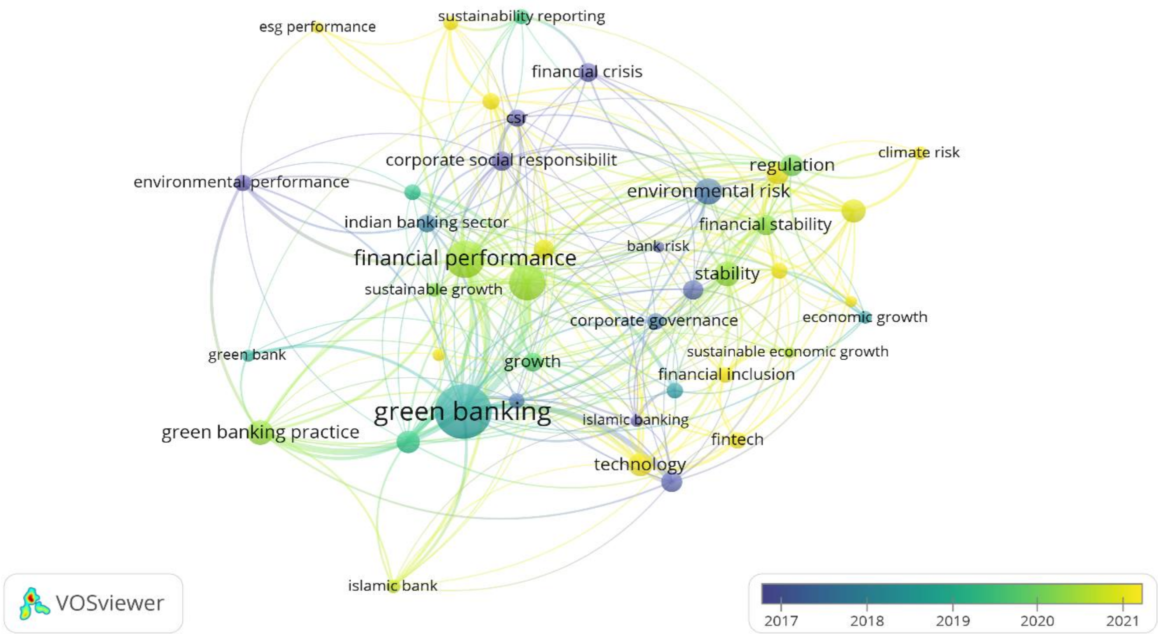

Figure 2. Overlay Visualization
Source: Data Analysis Result, 2024

The visualization uses a color gradient from purple to yellow to indicate the timeline from 2017 to 2021, showing how various themes have developed and interlinked over these years. Nodes represent key topics, and their size reflects the frequency of these topics in the literature. Lines connecting these nodes represent the relationships and co-occurrences of these topics in scholarly articles, revealing how these concepts are discussed in relation to one another.

1. Early years (2017-2018): Focus on foundational aspects of green banking and its initial impacts on environmental performance. Several keywords identified in this period such as “corporate social responsibility”, “environmental performance”, “environmental risk”, “corporate governance”, “Islamic banking”, and “financial crisis”.
2. Middle to late years (2019-2021): A noticeable shift towards integrating green banking practices more comprehensively within the frameworks of financial performance and sustainable growth, indicating a maturation in how green initiatives are perceived in terms of their economic viability and necessity. Several keywords identified in this period including “green banking”, “sustainable reporting”, “sustainable growth”, “financial performance”, “financial stability”, and “regulation”.
3. Later years (2020-2021): Discussions evolve towards broader implications of these regulations, including sustainable economic growth and financial inclusion, suggesting a broader scope of regulatory impacts spreading into inclusive banking. Several keywords found in this period like “technology”, “fintech”, “financial inclusion”, “climate risk”, and “esg performance”.

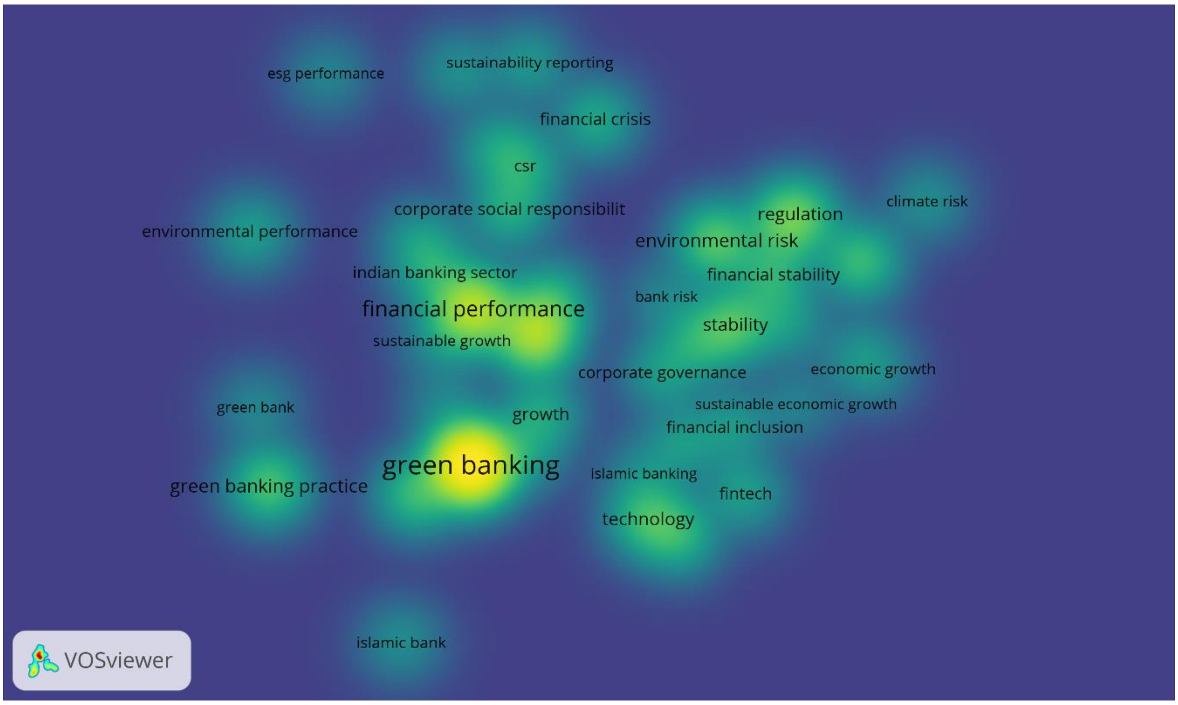

Figure 3. Density Visualization

Source: Data Analysis, 2024

Figure 3 above use a color gradient to signify the concentration or intensity of research activity around certain topics related to banking, sustainability, and risk management. In this bibliometric map, brighter areas likely indicate higher concentrations of research, whereas less bright or darker areas may represent lesser-explored topics or those with potential gaps in the literature. The major nodes—such as green banking, financial stability, fintech, sustainability reporting, and corporate social responsibility (CSR)—are brightly colored and closely interlinked, indicating well-researched areas with significant academic output. The clustering of terms around green banking practices, financial performance, and technology integration (fintech) suggests a robust discourse within the banking sector about aligning financial strategies with sustainable practices.

The less bright area around "Islamic bank" and its connection to "green banking" and "technology" suggests a relatively underexplored area. Research here could focus on how Islamic banking principles, which emphasize risk-sharing and ethical investing, could be further aligned with green banking practices. This could involve exploring the potential for Sharia-compliant financial products that fund renewable energy projects or support environmental sustainability initiatives.

Although "environmental risk" and "climate risk" are present, their less bright representation indicates room for deeper exploration. Future research could examine how banks are integrating climate risk into their financial risk management frameworks. This is particularly pertinent as financial institutions increasingly need to manage risks associated with climate change, such as physical risks to assets or transition risks associated with moving towards a low-carbon economy.

The node for "corporate governance" shows connectivity to sustainability-related topics but appears less intense compared to other areas. This suggests an opportunity to explore how governance structures and practices can be optimized to better support sustainability goals. Research could focus on the roles and responsibilities of board members in driving sustainability agendas, or on how governance frameworks can incorporate sustainability performance indicators.

This map not only reflects current research trends but also highlights areas with potential for further exploration. Focusing on lesser-bright areas could provide new insights into how banking can evolve to better address emerging risks and opportunities in sustainability. Investigating these gaps could contribute significantly to the literature, offering fresh perspectives on integrating ethical, environmental, and economic dimensions within the banking sector. This approach aligns with global trends towards sustainability and could help in developing more resilient and adaptive financial systems.

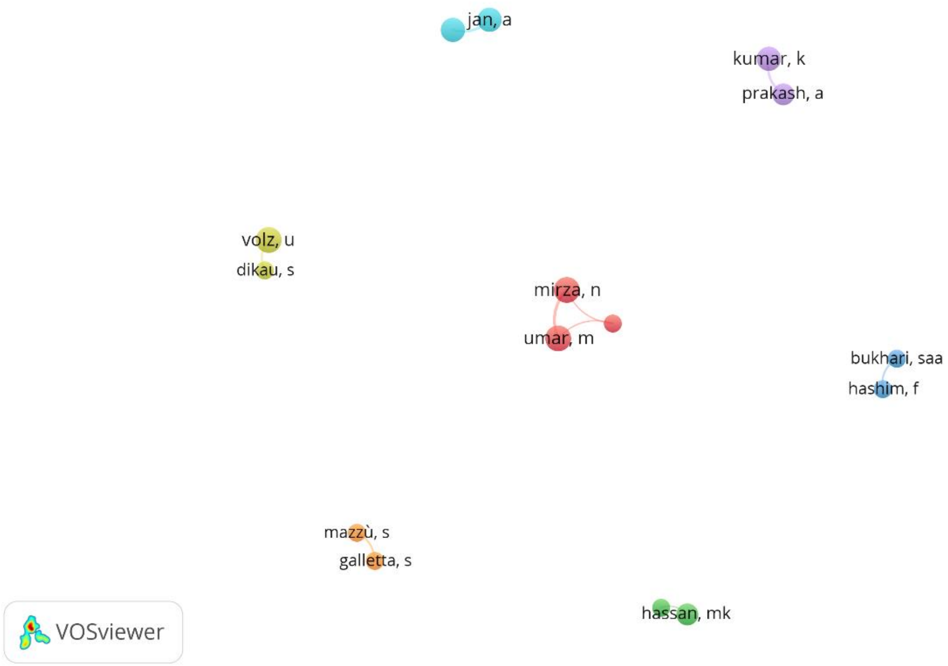

Figure 4. Author Collaboration Visualization
Source: Data Analysis, 2024

This last figure is a bibliometric network visualization mapping the connections between various researchers, indicated by their last names and initials. This type of visualization is often used to illustrate collaborations or thematic linkages between researchers based on co-authorships or thematic similarities in their published works. Each node (label) represents an individual researcher, and the proximity or clustering of these nodes can imply a collaborative relationship or a shared focus within a particular field of study.

In this specific visualization, researchers are color-coded, likely representing different clusters or groups based on their research focus or geographic/regional collaborations. For instance, the group containing "Mirza, N" and "Umar, M" highlighted in red might be closely collaborating or working within similar research domains. In contrast, researchers like "Jan, A" in blue and "Hasan, MK" in green could be indicating other distinct groups or thematic focuses.

5. CONCLUSION

The bibliometric analyses you've presented collectively provide a comprehensive overview of research trends and collaborative dynamics in the context of sustainability and risk management within the banking sector. The thematic clusters identified in the first visualization underscore a strong emphasis on green banking practices, financial performance, and the integration of technology, revealing a robust academic discourse on aligning financial strategies with sustainable practices. The subsequent analyses highlighted a shift in research focus over time, from foundational concerns of financial stability to more integrated discussions on sustainability and inclusive economic growth, suggesting an evolving field responsive to global economic and environmental challenges. Opportunities for further research were identified in areas such as Islamic banking's role in green practices, and climate risk management, indicating underexplored niches that could yield valuable insights. Lastly, the analysis of author collaboration reveals a diverse network of scholars, suggesting both focused groups working within specific research domains and broader, interdisciplinary collaborations, which are essential for advancing comprehensive strategies in sustainable finance. These insights collectively suggest a dynamic and maturing field of study, ripe with opportunities for significant contributions to both theory and practice.

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