

Review

# Bank Risk Literature (1978–2022): A Bibliometric Analysis and Research Front Mapping

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**Abstract:** This study maps the conceptual structure of the body of knowledge concerning bank risk to understand this research strand better. A bibliometric analysis including 671 publications from January 1978 to October 2022 was conducted to achieve the aim of the study. The analysis of descriptive indicators identifies the main traits of scholars debating bank risk in terms of the annual production of publications; most productive authors, countries, affiliations, and journals; and most cited articles in the dataset. This study performs a co-word analysis by adopting social network analysis tools to analyze the conceptual structure of the dataset. The results highlight growing academic interest in bank risk research topics, especially following the global financial crisis. The bibliometric analysis reveals three main topics concerning the consideration of bank risk: (1) the adoption of risk management and bank risk, (2) the use of bank risk during the financial crisis, and (3) the interrelations between corporate governance and bank risk.

**Keywords:** bank risk; bibliometric analysis; co-occurrences; co-word analysis; conceptual structure map; Scopus



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## 1. Introduction

Since the global financial crisis (GFC) of 2008, bank risk has received considerable attention from academics, bankers, and regulators. It is a divergent topic and is related to many functions, whether inside or outside the bank. This crisis highlighted the tendency of banks to take excessive risks to achieve the highest possible returns [1,2]. In addition, bank risks are expected to evolve and change over time, owing to changes inside and outside banks. According to [3], the bank risk function will be different in 2025 than it is today. The continuous increase in banking regulations, promotion of customer expectations, and exponential growth in risk types are the most critical factors that lead to fundamental changes in bank risk management functions.

Many studies have shed light on the complexity of the banking industry, which is surrounded by various risks, whether financial or non-financial [4–7]. Over time, banks' risks have become more threatening to the operations and survival of the entire banking industry [8]. Consequently, banks must understand and determine their risk exposures [9]. Additionally, a deep comprehension of different risks is vital for banks to set appropriate risk management strategies to mitigate those risks [10]. Although various studies

have examined bank risks, there are many universal definitions of risk in the banking context. For instance, ref. [8] expounded bank risk as an exposure to the unpredictability of an outcome containing a probability of variation in the desired or expected returns [8]. Moreover, ref. [11] defines risk in banks as a potential loss that may occur due to antagonistic events, such as economic downturns, adverse fiscal and trade policy changes, unfavorable movements in interest or foreign exchange rates, or declining equity prices. Furthermore, refs. [12,13] interpret risk in banking as an undesirable impact on returns due to various distinct sources of uncertainty.

There are many types of bank risks, and many studies have discussed these risk types. For example, ref. [14] groups bank risks into the market (systematic), operational, and legal types. Moreover, ref. [12] extends the categorization of ref. [14] by introducing seven additional types: credit risk, liquidity risk, solvency risk, foreign exchange risk, country (political) risk, settlement risk, and interest rate risk. In addition, ref. [15] adds business, reputational, and strategic risks to the bank risk list. Other studies expand the bank risks to include regulatory, rate of return, concentration, price (equity), and residual risks [9–16]. However, ref. [17] categorizes bank risk into three main clusters: credit, market, and operational risks. The authors of ref. [2] indicate that the primary bank risks are credit, market, and operational risks, along with other risks, including liquidity, business, and reputational risks.

Thus, the risk-management function is vital for banks to determine, measure, and mitigate all risks to enhance bank performance and maintain their ability to operate. Traditionally, credit risk has been banks' most significant risk [18]. Market risk arises primarily from a bank's trading operations, whereas operational risk is the risk of losses from internal system failures or external events [19]. However, technological innovations in the banking sector have introduced new risks and exacerbated traditional risks [20]. For these reasons, banks should adjust their strategies to meet these new challenges and risks [21].

The banking system plays a crucial role in modern market-based economies and has received the attention of many stakeholders in financial markets, such as regulators, market supervisors, shareholders, borrowers, and bondholders. There is an urgent need to provide a holistic picture of the risks banks might encounter to understand and mitigate them correctly and on time.

Credit risk management has been a topic of international concern since 1974 when the Basel Committee for Banking Supervision was established in response to the banking crisis that impacted a subset of financial institutions in 1973 [22]. The international Basel capital rules and the Basel Core Principles for Effective Bank Supervision were gradually adopted by governments all over the globe to model the regulatory standards and procedures of the developed countries at the heart of the financial storm [23]. Basel I (1988), Basel II (2004), and Basel III (2010) are the three most essential documents produced by the Basel Committee and the basis for coordinated worldwide efforts. Bank capital is a measurement for gauging the risk associated with a bank's assets. The rules governing the minimum capital that a credit institution must hold are outlined in these accords. This retained capital is used for, among other things, risk analysis, regulatory oversight, and market discipline [22,24–26].

In 1988, the Basel I Accord was created to regulate commercial banks' minimum capital requirements to safeguard against credit risk. Basel requires banks with a global presence to have a level of capital (Tier 1 and Tier 2) equivalent to at least 8% of their risk-weighted assets [27,28].

The Basel II Accord, published in 2004, is based on a set of guiding principles that aim to establish procedures that enable financial institutions to identify and measure all risks (such as credit, market, and operational risks). These principles also help assess the adequacy of banks' capital concerning their risk profile and their strategy and business plan to ensure sufficient funds to offset the adverse effects of all the hazards [27,29–32].

Banks' required risk-weighted capital ratios were raised under Basel III, and the definition of regulatory capital was expanded [24]. According to Basel III, the stock market's perception of the systematic risk of equity in U.S. Globally Systematic Important Banks (GSIBs) has decreased. Still, this fact does not account for the decrease in return on equity (ROE), which may reflect a considerable increase in bank financial risk [27,33–35].

For several reasons, banks' voluntary risk disclosures are not always the best option. First, while choosing the quality, amount, and frequency of disclosures, banks assess the expenses against the possible advantage of decreased financing costs. Additionally, voluntary disclosures may not always result in the best outcomes since banks have many ways of determining what information to disclose [36].

The research community is established via the cooperation among researchers, which is reflected in the growing literature [37]. Hence, it is crucial to examine the effect of interdisciplinary collaborations among academics [38]. It may also be essential for banks to improve their organizational structure to reduce risk-taking. Academic researchers and journals from finance, management, and international business should consider developing and publishing more theoretical frameworks to explain risks in banks, suggesting that central banks' policies effectively mitigate bank risk.

Therefore, the present study aims to help scholars understand the existing knowledge base of bank risk and its research networks across authors, journals, institutions, and countries. In doing so, this study uses bibliometric analysis, which is the most optimal method for depicting the characteristics and evolution of published studies within a specific field of research [39–41].

Specifically, this study aims to find notable changes in the development of key terms in the field of bank risk in the last few decades (from 1978 to 2022). The primary study objectives are to (1) identify seminal contributions to the field of bank risk research during that period, (2) quantify the volume of relevant research articles (in terms of the number of publications), (3) identify the most frequently used terms and keywords in bank risk articles across three distinct periods, and (4) present a thematic map of the dominant topics in bank risk research. This study aims to fill this knowledge gap by identifying, summarizing, and assessing available research on bank risk. Specifically, this study seeks to answer the following questions: (1) Is this research area active in publications? (2) Who are the most productive authors? (3) What are the most cited articles? (4) Which countries contributed the most? (5) Which universities contributed the most? (6) Which journals are most productive in this research area? (7) Which keywords received the most attention from the authors? (8) What are the patterns of collaboration and co-citation trends?

Research questions focus on how a corporation with a low interest in bank risk may benefit from including the environmental, social, and governance (ESG) dimensions in its corporate social responsibility (CSR) and sustainability reporting to achieve financial stability for banks. Therefore, there is a need for further theoretical research on the connection between ESG performance policies and bank risk. Only recently have the goals and scopes of finance and accounting journals expanded to include discussion of the relationship between environmental sustainability and bank risk-taking.

This study offers insights into bank risk research by providing a systematic literature review of the bank risk historical direction, leading figures, institutions, and related journal articles. This is important as the numbers of publications and citations in the banking sustainability research (i.e., sustainable development, financial stability, and application of ESG performance and disclosure) have increased in a sporadic approach over the last several years. Our findings will also help future researchers to understand bank risk evolution, recognize new research directions, and accurately search for journal papers.

The current study has several contributions. First, we provide an overview of the development of bank risk research over the past four decades by analyzing many relevant documents. Hence, we help comprehensively understand the field's evolution and the critical topics studied. Second, by conducting a bibliometric analysis, the paper maps the research front in bank risk research. Thus, it helps to identify the most influential articles,

authors, institutions, and countries in the field, which can provide helpful information for researchers in this area. Third, the bibliometric analysis performed in the study can help to identify gaps in the literature and areas where further research is needed. So, we offer valuable information for future researchers looking to contribute to the field and build on the existing body of knowledge in bank risk research. Finally, the bibliometric analysis in this paper allows for identifying key trends and patterns in the development of the field of bank risk research. Therefore, our study offers insights into the direction of future research and the most promising areas for investigation.

The current study has several contributions. Given the broadness and divergence of the bank risk topic, we provide a recapitulated and updated picture of bank risk research over the past four decades by analyzing many relevant documents. Hence, we help comprehensively understand the field's evolution and the critical topics studied. Additionally, ref. [39] argued that the bibliometric approach adds two new functions to literature analysis: performance and mapping analyses. Performance bibliometric analysis helped identify the most influential articles, authors, institutions, and countries in the field, which can provide helpful information for new researchers in this area. Furthermore, the mapping analysis performed in the study can help depict the knowledge structure of this research domain. Mapping analysis provides valuable visualizations that depict key trends and patterns in the development of the field of bank risk research. It also provides valuable insights into the topics that received extensive attention in prior literature and other potential research gaps that need further research. So, we provide interested researchers with insights into the current body of knowledge in the bank risk domain, future research directions, and the most promising areas for investigation.

This paper is organized as follows: Section 1 introduces the current research. Section 2 provides a literature review. Section 3 describes the methodology adopted to retrieve and select the relevant papers for analysis. Section 4 presents the bibliometric analysis results. Section 5 discusses the finding of this study. Section 6 presents conclusions. Section 7 provides the theoretical and practical implications of our study. Section 8 shows the limitations of this study and directions for future research.

## 2. Literature Review

Participants in financial markets may benefit from a deeper understanding of bank risk [42]. The spread of COVID-19 and the Russian–Ukrainian conflict have called into question the global banking industry's susceptibility and activities. During the COVID-19 pandemic, it was observed that there is a significant degree of correlation between the international markets [43], which leads to banks taking on more risk. Thus, it threatens the financial system's health and has knock-on effects on the economy via less access to credit and fewer businesses investing in the expansion [44]. Following the financial crisis of 2007–2008, regulators and scholars began focusing on banks' systemic risk, or vulnerability to future systemic problems, rather than banks' risk [45]. More importantly, bank boards were ineffective in monitoring and controlling bank risk [46]. Therefore, banks are pushed into investing in high-yielding but high-risk financial assets [47].

Furthermore, technology plays a vital role in bank risk research, specifically in understanding consumer behavior. Technological advancements have enabled new and innovative methods to measure consumer behavior toward bank risk. One widely used technique in the economic and neuroeconomic fields is functional near-infrared spectroscopy (fNIRS) [48,49]. Like functional magnetic resonance imaging (fMRI), fNIRS can effectively measure metabolic activity in the brain. fNIRS can record and map the brain's oxyhemoglobin and deoxyhemoglobin during brain activity. It can determine which brain regions are more active during different tasks related to bank risk [48]. For instance, in the bank risk field, the authors of ref. [49] state that information on customer knowledge of deposit insurance and opinions on the safety of both small and large banks is needed. They draw the following conclusions: (1) individuals see their bank as safer than other banks; (2) people view systemic banks as less risky than non-systemic banks.

Moreover, banking institutions that are particularly susceptible to risk may choose to divide the burden of big loans across many parties [50] (1). Conventional and non-traditional banking operations may be affected by banks' market power and competitive conduct [51] and influenced by banks' propensity for taking risks [52–54]. Moreover, when risks are taken, they may spread to other financial institutions through contagion, and the stability of the entire financial system may be at risk due to banks' reckless behavior [55]. For instance, ref. [56] finds that banks with more aligned compensation for bankers and more independent boards of directors took less risk. Regulators have recently prioritized governance improvements to limit banks' willingness to take risks [57].

Reference [58] argues that governance plays a significant role in assisting banks in pursuing an "optimal" level of risk that permits management to maximize shareholder profit while simultaneously considering the societal costs of bank failures. However, banks are more willing to take risks with government guarantees [59]. Reference [1] finds that off-balance-sheet actions are significantly correlated with bank risk. Their results showed that the dividend payout ratio is negatively associated with market, credit, and liquidity risks. In addition, large banks are associated with high total risks and low credit risks.

According to ref. [60], environmental actions ultimately decide how banks reduce risk, and on the other hand, the outcomes of social and governance initiatives are less clear. Reference [61] finds a positive correlation between charter value and bank risk; this might mean that institutions with higher charter values are more likely to engage in risky, rapid expansion. Reference [62] demonstrates a balanced relationship between banks' openness regarding risk appetite and willingness to take risks. In addition, banks are likely to take risks through their operations in offshore financial centers when they offer more opportunities for regulatory arbitrage [63]. In addition, banks in countries with more stringent regulations on bank capital are more likely to take risks through their offshore financial center operations.

Reference [36] finds an increase in bank risk disclosure after the establishment of the European Banking Union, while banks subject to the Single Supervisory Mechanism disclosed bank risk less than their counterparts subject to national supervision. According to ref. [64], more extensive and more financially stable banks are more susceptible to systematic risk due to the negative consequences of opacity spillovers, including lower profits, worsening asset quality, and more earnings volatility. Further, ref. [65] argues that a rise in credit and/or liquidity concerns have a significant and unfavorable impact on the profitability of MENA banks. It is also shown that a bank's profitability considerably reduces credit and liquidity concerns. Law and order were also found to reduce credit and liquidity risks for MENA financial institutions while increasing their profitability. Reference [66] demonstrates that African banks are willing to take on greater risk when the monetary policy stance is expansionary, while ref. [67] illustrates that CEO compensation contracts and surplus reserves have a favorable and substantial effect on risk-taking and credit risk.

Across the ASEAN region, banks with higher capitalization are more productive and risk-averse. However, high-efficiency banks often keep just a tiny amount of capital, whereas low-efficiency banks keep a high capital ratio [68]. During economic downturns, banks that provide CEOs more risk-taking incentives tend to be more unstable [69]. Bank stability decreases when geopolitical risk rises [70]. Explicit tradeoffs between risk-increasing agency issues and risk-decreasing diversification, liquidity management, and synergy improvements may be spawned by the bank's geographical, economic, and organizational complexities [71]. In the wake of the COVID-19 crisis, a liberalization of monetary policy has a more noticeable negative impact on the performance of smaller banks with more credit risk, lower capitalization, and lower liquidity [61].

As detailed in ref. [72], businesses face unfavorable bank loan conditions due to climate risk (higher interest paid, higher likelihood of being required to collateralize the loan, and more significant number of covenant constraints). Reference [45] argues that the systemic risk of financial institutions is greater when they are led by overconfident CEOs than when

they are led by less confident CEOs. Though the adoption of China's Green Credit Policy lowered credit risk for the country's largest state-controlled banks, it raised credit risk for the country's city and regional commercial banks [73]. Reference [74] states that increasing solvency risk directly results from higher financing costs for Korean banks. Reference [75] reveals that following the agency theory, bank solvency rises with the increase in the board of directors' independence and decreases with the increase in the size of the board and its committees.

According to ref. [76], opacity is connected positively with actual bank risk. To be more precise, banks' realized risk is lower when they hold more available-for-sale securities and more excellent when they contain more off-balance-sheet items. Stock return volatility, tail risk, and idiosyncratic risk are lower for banks in more religious communities. Further, their Z-scores also indicate that they are farther from risk default [77].

Several studies use different measurements for bank risk-taking; value-at-risk (VaR) and expected shortfall are two examples of tail risk metrics used to assess losses in the event of extreme market risk [78–83]. The risk associated with stock price volatility is another popular metric [84–92]. Moreover, a Z-score is an accounting-based indicator of default risk [83,93–103]. Alternatively, there is a market-based metric based on Merton's structural distance-to-default model [104–113]. Studies also attempt to assess the value of the government's financial safety net to shareholders as the value of a put option by taxpayers, which is another way risk shifting may be quantified [114–122].

The term "leverage risk" describes the danger that might occur when a financial institution has insufficient capital to cover its operations. Book capital ratios, such as those for high-quality (Tier-1) capital or risk-adjusted capital, are often used to assess the degree of leverage risk [123–132]. Bank portfolio risk is calculated using the risk-weighted asset-to-asset ratio and book- or market-based asset volatility measures [60,124,133–141]. Financial institutions may improve their risk management and prudential policy decision-making with the help of sustainability activities. Banks can learn how to transition to an economic system that more effectively internalizes externalities [142].

Overall, bank risk disclosure has improved due to the European Banking Union (BU); however, it has weakened for banks under the Single Supervisory Mechanism (SSM) compared to those under national authorities' watch. Moreover, it has been discovered that the BU's beneficial impact on bank disclosure is more significant for less profitable banks and the most distressed economies of the Eurozone (GIPSI nations). Still, the BU's negative effect on centrally overseen banks is more substantial if bank CEOs also operate as chairmen (CEO duality) [36]. Local supervisors have specific interests related to the area under their supervision that might be damaging to system-wide financial stability, whereas a central supervisory body would prioritize the stability and welfare of the whole financial system above any local regions [143].

Researchers also want to point out the way toward future research by posing prospective study questions and difficulties based on the investigated topics. Borrowers who rely on banks for lending are likewise interested in bank risk, as are bondholders who worry about the likelihood of bank failure and concentrate on metrics such as total risk and idiosyncratic risk [1]. The results of several papers published on bank risk have been gathered from numerous studies using various techniques. Hence, bibliometric analysis tries to shed light on new aspects of banks' risk-taking behavior by collecting and synthesizing the existing literature.

### 3. Methodology

A bibliometric analysis approach is employed to achieve the objectives of this study. This approach provides a quantitative analysis of the literature [144]. Bibliometric tools lead to the analysis of performance and mapping of research trends in a specific research field to illustrate the most recent progress and direction for future research gaps in that research area without subjective bias [145,146]. Bibliometric analysis is a beneficial tool for researchers as it guides them to the most important publications in the research area. It is

also helpful in identifying research gaps and areas under investigation. By identifying the areas of research that have not been well studied, bibliometric analysis can help to identify potential areas for future research.

In addition, bibliometric analysis can be used to evaluate the impact of research by analyzing the number of citations that a particular article or journal has received. It is possible to determine the level of impact that the research has had on the field. This information can be used to evaluate the study's quality and identify the most influential research in a particular area.

Bibliometric analysis is widely used across various disciplines. In economics and finance, it has been applied in multiple sub-fields, such as green finance, financial literacy, Islamic finance, and behavioral economics and finance [147–150]. The versatility and applicability of bibliometric analysis were demonstrated by examining research trends and practical applications of neuromarketing [151,152]. In this sense, the bibliometric analysis carried out in the field of neuromarketing has proven to be a valuable tool for gaining insight into the global trends within the field. This analysis assesses essential metrics, including the number of publications, citations, and productivity of countries and academic institutions, which allows for an evaluation of the field's impact [153,154]. In bibliometric analysis, the literature selection process is essential to ensure the validity and consistency of the subject under investigation.

### 3.1. Data Sources and Data Collection

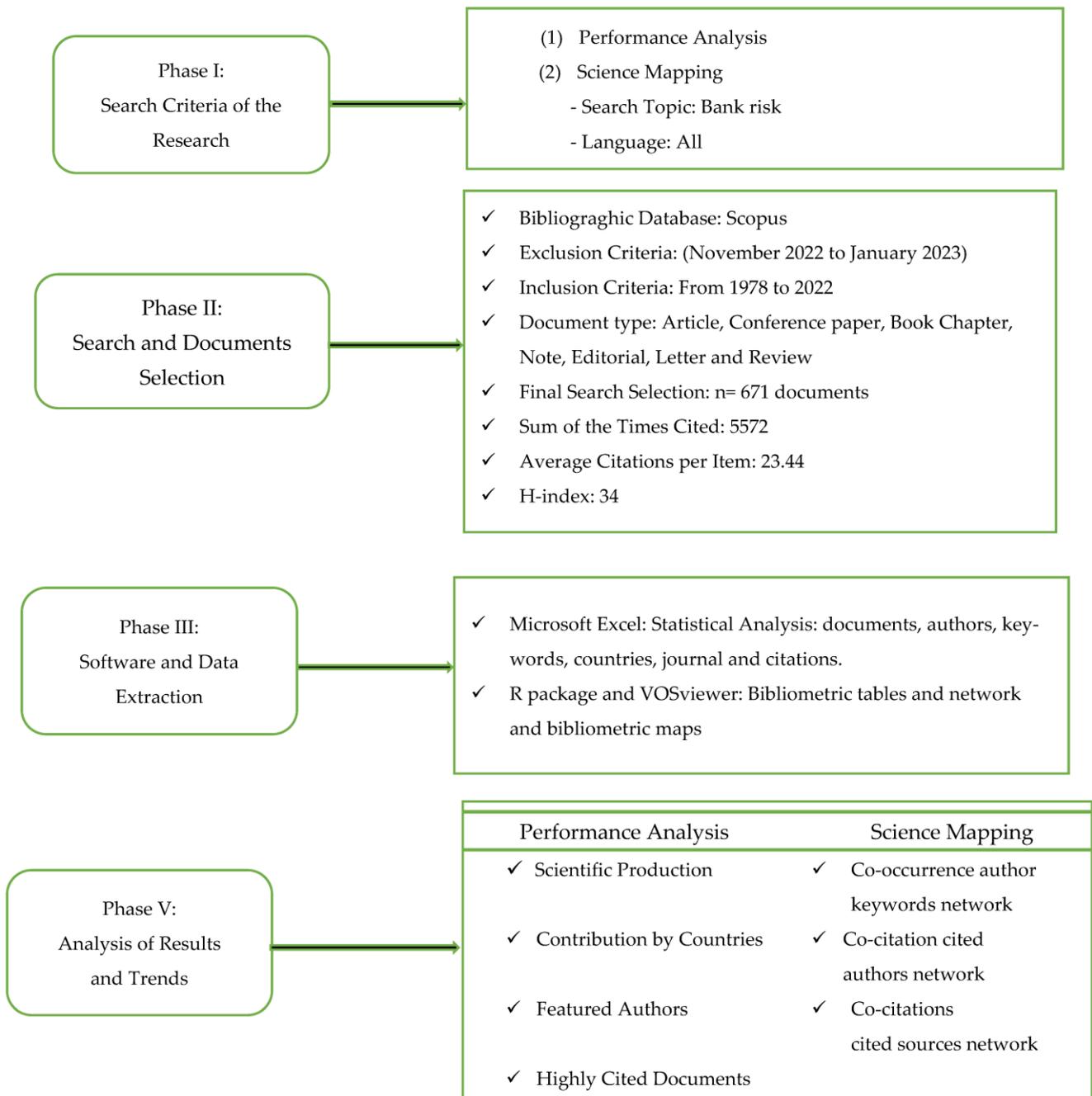
Figure 1 shows the process of data analysis using bibliometrics. This study follows a systematic process of four phases (see Figure 1) that allow the analysis and bibliometric maps to be carried out: (i) search criteria of the research field, (ii) search and document selection, (iii) software and data extraction, and (iv) analysis of results and trends.

Figure 2 shows the research protocol applied in the present study to achieve its objectives. Firstly, we determine the scope of the research (topic of interest, the database to be searched, and the period to be covered). Secondly, we determine, extract, and screen bibliometric data. Finally, we describe the data collection procedures and tools used in this study.

The Scopus database was selected for a comprehensive search owing to its good recognition among the scholarly community and broad coverage and reliability [155]. Nevertheless, there is a significant overlap between the Scopus and Web of Science (WoS) databases, as both cover a wide range of scholarly literature in various fields. The main reason behind choosing Scopus is its more extensive coverage of international publications. Its broad scope makes it an excellent resource for tracking global research trends and identifying key players in a field.

We endeavored to define a broad research query (TITLE (“bank risk”)) to find all possible publication data focusing on the topic of bank risk. The search was performed on titles to extract studies related to the research subject (bank risk). This process resulted in a total of 671 contributions, and nothing was removed since they were directly related to the research's main topic.

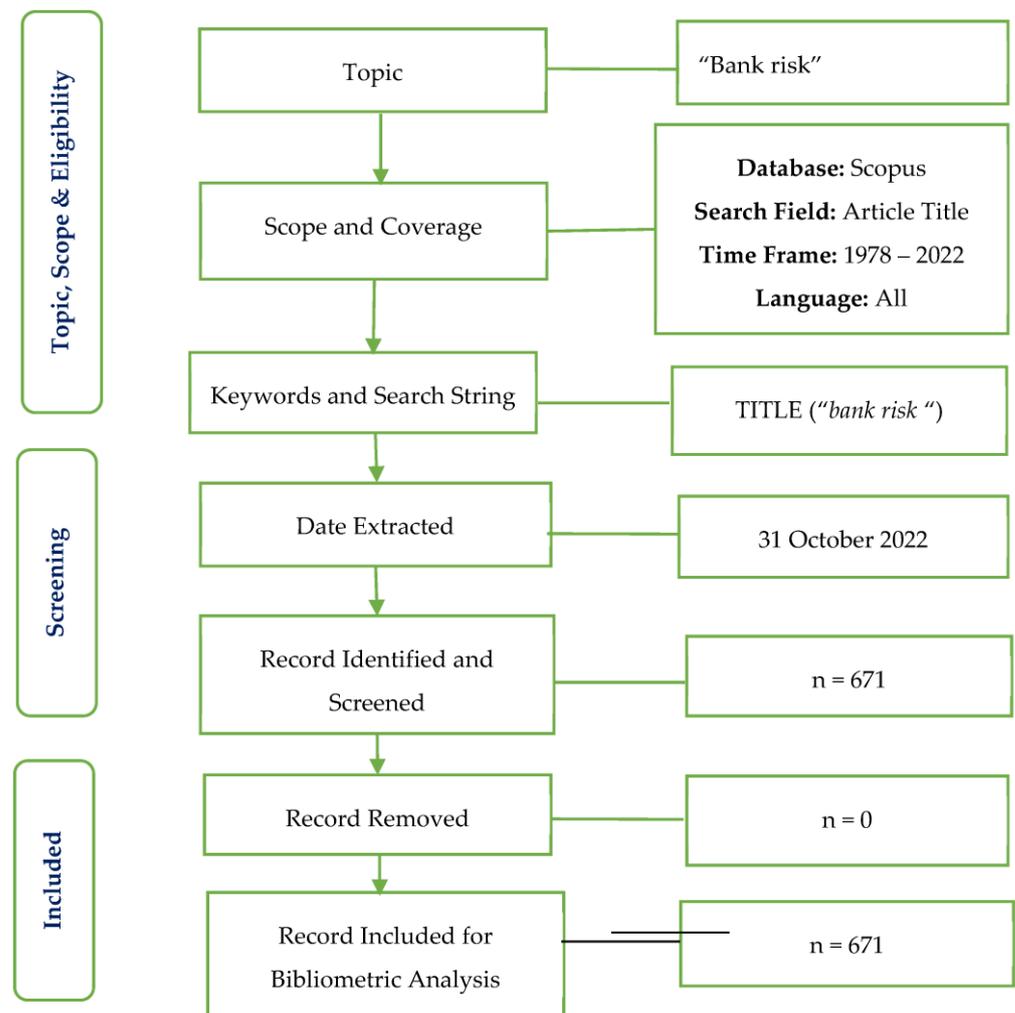
This study covers literature from January 1978 to October 2022. The rationale behind using the sample period between 1978 and 2022 is twofold. First, we want to ensure the most extensive coverage possible of the literature on bank risk. Starting from 1978, we can include all relevant literature on the subject and provide a comprehensive overview of the field. The second reason is that the earliest contribution on this subject, which indicates the issue in the paper's title, was published in 1978 in the *Journal of Banking and Finance*, titled “The Effect of Deposit Rate Ceilings on Bank Risk”. We aim to include all relevant literature since its origination and to provide a historical perspective on the evolution of research in this area. The end date of 2022 was chosen to ensure that our analysis includes the most recent literature on the topic.



**Figure 1.** Methodological scheme of the process carried out in the study.

### 3.2. Analysis and Tools

Because any research discipline’s literature is growing exponentially, acquiring knowledge about a specific topic or field becomes arduous. Consequently, conducting bibliometric analysis is vital for preparing a systematic literature review. This study employed “Biblioshiny” as a tool in the R programming language and VOSviewer software to conduct a bibliometric analysis of the collected research contributions. The “Biblioshiny” R-package and VOSviewer software are used to generate a general performance analysis of the literature. This analysis shows the literature growth pattern, most influential authors, citation structure, topic progress pattern, and trend analysis. It was then used to conduct both descriptive and network analyses.



**Figure 2.** Research Protocol.

## 4. Results

### 4.1. General Information

Table 1 presents data derived from the “Biblioshiny” tool. A total of 671 contributions came from 297 different sources, which indicates the spread of documents related to bank risks over many sources, reflecting the need for a centralizing outlet that focuses on this specialized research area. Most papers are favorable articles as they are peer-reviewed. However, analyzing all document types can be attributed to the desire of the researchers to provide a holistic picture of the different risks that banking systems face. Moreover, these documents were authored by 1152 authors, while a single author wrote 109 papers.

**Table 1.** General Information.

Description	Results
MAIN INFORMATION ABOUT THE DATA	
Timespan	1978:2022
Sources (journals, books, etc.)	297
Documents	671
Average years from publication	7.05
Average citations per document	23.44
Average citations per year per document	2.553
References	26,709

Table 1. Cont.

Description	Results
DOCUMENT TYPES	
Article	605
Book	1
Book chapter	21
Conference paper	29
Editorial	2
Note	2
Review	9
Short survey	2
DOCUMENT CONTENTS	
Keywords Plus (ID)	541
Author's Keywords (DE)	1286
AUTHORS	
Authors	1323
Author appearances	1650
Authors of single-authored documents	121
Authors of multi-authored documents	1202
AUTHOR COLLABORATION	
Single-authored documents	136
Documents per author	0.51
Authors per document	1.96
Co-Authors per document	2.44
Collaboration index	2.23

The collaboration index is relatively high (2.28), reflecting the interdisciplinary nature and broadness of the research, and is attributed to the difficulty faced by a single author in understanding and saturating the different types of risks faced by various banking systems in different regulatory contexts worldwide. Therefore, cooperation between the authors in developing a single study can be justified.

#### 4.2. Descriptive Bibliometric Analysis

The descriptive bibliometric analysis is divided into seven sub-sections: the annual publication trend, most productive authors, most cited papers, publishing activity by country, publishing activity by affiliation, journals' publishing activity, and most frequent keywords.

##### 4.2.1. Number of Annual Publications

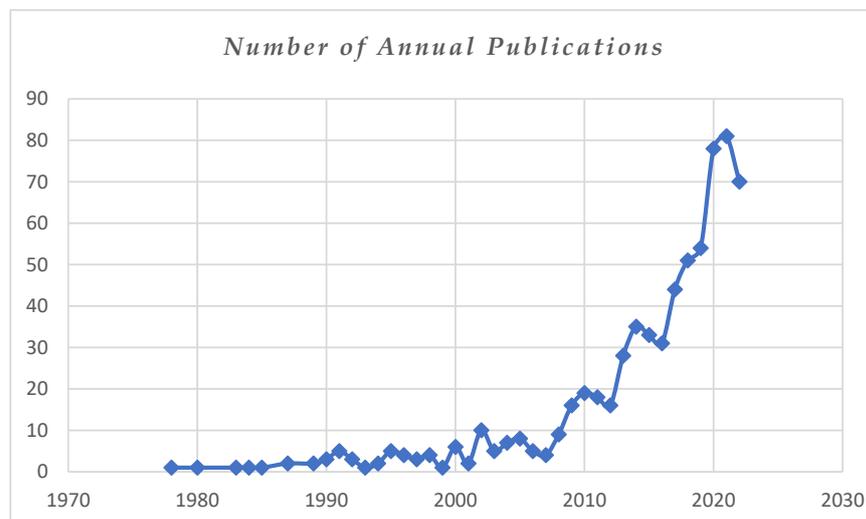
More than four decades have passed since the first contribution to the bank risk literature. The paper ref. [156] titled "The Effect of Deposit Rate Ceilings on Bank Risk" was published in 1978 in the *Journal of Banking and Finance*. However, limited attention was paid to bank risk until 2008, when the GFC occurred. Since then, the number of publications annually has increased substantially.

Annual publications in this area reached their peak in 2022. The exponential increase in yearly publications observed after 2020 can be attributed to the tendency of researchers to measure the effect of COVID-19 on different aspects of bank risk. Figure 3 shows the annual scientific production trend until 2022. While Figure 3 shows a going-down curve for publications in 2021, the overall annual publication is trending upward. This increasing pattern indicates that "bank risk" is paramount for researchers, practitioners, and regulators.

##### 4.2.2. Languages of Documents

Document language was also determined by analyzing the collected datasets. As shown in Table 2, the language used for bank risk publications is mostly English (97.62%).

Some of these publications are available in more than one language, i.e., Chinese (0.75%), Italian (0.15%), Russian (0.45%), Ukrainian (0.30%), French (0.30%), German (0.15%), and Spanish (0.30%).



**Figure 3.** Publication Trend.

**Table 2.** Language of the documents.

Language	Number of Articles	%
English	655	97.62
German	1	0.15
Chinese	5	0.75
Italian	1	0.15
Spanish	2	0.30
Russian	3	0.45
Ukrainian	2	0.30
French	2	0.30
Total	671	100

#### 4.2.3. Most Productive Authors

In total, 1323 authors authored 671 documents. Table 3 provides insights into the top 10 productive authors in the “bank risk” field. As can be seen, the leading contributing author is “Ashraf B.N.” with seven contributions. Then, “Zhang J.”, “Delis M.D.”, and “Li J.” come next with five contributions each.

**Table 3.** Details of the Ten Most Productive Authors.

Author	NP	h_Index	g_Index	m_Index	TC	PY_Start
ASHRAF BN	7	7	1	238	7	2016
ZHANG J	5	9	0.455	91	11	2012
DELIS MD	5	6	0.417	702	6	2011
LI J	5	6	1	78	6	2018
CHEN M	4	6	0.5	197	6	2015
HAQ M	4	6	0.364	132	6	2012
SAUNDERS A	4	6	0.121	685	6	1990
WANG R	4	6	0.5	187	6	2015
WU J	4	6	0.5	196	6	2015
ABBAS F	3	4	1	17	6	2020

Note: NP: number of publications, TC: total citations, PY\_Start: publication year of the first article.

#### 4.2.4. Most Cited Papers

Tables 4 and 5 show the most cited papers globally and locally. Global citations refer to the number of citations of a paper, whereas local citations evaluate the frequency of each selected paper cited by collecting chosen articles. Reference [157], which reviews the existing literature, is the most cited paper. It also concludes that moral hazard is amplified and banks tend to take on more risk when competition increases intentionally. The second most cited paper, ref. [158], investigates the relationship between bank ownership structure and risk-taking. It concludes that stockholder-controlled banks exhibit significantly higher risk-taking patterns than managerially controlled banks during deregulation (1979–1982). The third most cited paper is ref. [159], which attempts to clarify the relationship between collateral and credit risk. Empirical evidence indicates that collateral is often associated with riskier borrowers, loans, and banks. The remaining top-cited articles cover various factors affecting bank risk-taking, including regulation, board composition, creditor rights, interest rates, and accounting discretion [42,93,95,135,160–164]. It is worth noting that ref. [157] has the most local citations.

**Table 4.** The Ten Most Cited Papers (Global).

Study	Title	Journal	TC	TC/Year
1.	The theory of bank risk-taking and competition revisited	Journal of Finance	852	47.3
2.	Ownership structure, deregulation, and bank risk-taking	Journal of Finance	530	16.1
3.	Collateral, loan quality and bank risk	Journal of Monetary Economics	500	15.2
4.	Rating banks: Risk and uncertainty in an opaque industry	American Economic Review	496	23.6
5.	Strong boards, CEO power and bank risk-taking	Journal of Banking and Finance	481	34.4
6.	Creditor rights, information sharing, and bank risk-taking	Journal of Financial Economics	404	31.1
7.	Regulations, competition and bank risk-taking in transition countries	Journal of Financial Stability	332	27.7
8.	Capital regulation and bank risk-taking: A note	Journal of Banking and Finance	282	8.3
9.	Accounting discretion, loan loss provisioning, and discipline of ‘banks’ risk-taking	Journal of Accounting and Economics	267	24.3
10.	Executive board composition and bank risk-taking	Journal of Corporate Finance	264	29.3

**Table 5.** The Ten Most Cited Papers (Local).

Study	Title	Journal	LC	GC	LC/GC (%)
1.	The theory of bank risk-taking and competition revisited	Journal of Finance	70	852	8.22
2.	Creditor rights, information sharing, and bank risk-taking	Journal of Financial Economics	60	404	14.85
3.	Ownership structure, deregulation, and bank risk-taking	Journal of Financial Economics	57	530	10.75
4.	Regulations, competition and bank risk-taking in transition countries	Journal of Financial Stability	48	332	14.46
5.	Interest rates and bank risk-taking	Journal of Banking and Finance	46	228	20.18
6.	Strong boards, CEO power and bank risk-taking	Journal of Banking and Finance	46	481	9.56
7.	Factors affecting bank risk-taking: Evidence from Japan	Journal of Banking and Finance	32	150	21.33
8.	How does competition affect bank risk-taking?	Journal of Financial Stability	25	264	9.47
9.	Real interest rates, leverage, and bank risk-taking	Journal of Economic Theory	24	164	14.63
10.	Executive board composition and bank risk-taking	Journal of Corporate Finance	23	264	8.71

Note: LC: local citations, GC: global citations.

#### 4.2.5. Most Productive Countries

Table 6 shows that the 10 most productive countries produced 563 publications (84% from a total of 671 documents). The United States and China are the countries with the highest contribution to the “bank risk” research field (175 papers (26%) and 107 papers (16%), respectively), reflecting the importance of the banking system in the USA and China that reflects the GFC. Table 6 also shows that seven of the top ten productive countries are

developed countries, producing 61% of the total publications, demonstrating the attention given to economic research by developed countries. Malaysia and Pakistan are only the developing countries that highly contribute to this field of research (29 papers (4%) and 21 papers (3%), respectively).

**Table 6.** The Ten Most Productive Countries.

Country	Number of Articles	%
USA	175	26
CHINA	107	16
UK	69	10
GERMANY	41	06
FRANCE	32	5
ITALY	31	5
AUSTRALIA	29	4
MALAYSIA	29	4
SPAIN	29	4
PAKISTAN	21	3
Total	563	84
Total Sample	671	100

#### 4.2.6. Most Productive Affiliations

Table 7 shows the top ten productive affiliations in the “bank risk” field, which contributed 89 publications (13.26% of the total sample, 671 publications). Although the earliest research in the bank risk field started in 1978, the amount of research remains limited, even for highly productive institutions. The Southwestern University of Finance and Economics (China) comes at the top of the list with 12 publications (1.79% of the total sample, 671 publications), followed by the University of Economics Ho Chi Minh City (Vietnam) with 11 publications (1.64% of total sample, 671 publications).

**Table 7.** The Ten Most Productive Affiliations.

Affiliation	Number of Articles	%
Southwestern University of Finance and Economics	12	1.79
University of Economics Ho Chi Minh City	11	1.64
Bangor University	9	1.34
Huazhong University of Science and Technology	9	1.34
Jinan University	9	1.34
Renmin University of China	9	1.34
New York University	8	1.19
Tilburg University	8	1.19
Federal Reserve Bank of New York	7	1.04
Monash University	7	1.04
Total	89	13.26
Total Sample	671	100

Table 8 shows the top ten productive journals in the research field; these journals published 168 papers out of 671 (25.04%). It is worth noting that the selected 671 contributions were published in 297 sources. Table 8 lists the ten most abundant sources of published “bank risk” articles. The *Journal of Banking and Finance* appears to pay the most attention to bank risks, with 49 published papers accounting for 7.30% of the total publications (671). The *Journal of Financial Stability* and *Journal of Financial Services Research* came in second and third places in contributions (18 (2.68%) and 17 (2.53%), respectively).

**Table 8.** The Ten Most Productive Journals.

Source (Journal)	No. of Articles	%	h_Index	g_Index	% m_Index	TC	PY Start
Journal of Banking and Finance	49	7.30	24	48	53.3	2874	1978
Journal of Financial Stability	18	2.68	13	18	86.7	1203	2008
Journal of Financial Services Research	17	2.53	10	14	34.5	688	1994
Journal of Financial Intermediation	16	2.38	11	13	45.8	703	1999
Journal of International Financial Markets, Institutions and Money	16	2.38	9	12	42.9	272	2002
Research In International Business and Finance	12	1.79	8	10	114.3	203	2016
Banks And Bank Systems	12	1.79	2	10	12.5	11	2007
Journal of Money, Credit, and Banking	10	1.49	7	2	25.9	209	1996
Finance Research Letters	9	1.34	4	9	57.1	50	2016
Journal of International Money and Finance	9	1.34	7	4	33.3	346	2002
Total	168	25.04					
Total sample	671	100					

#### 4.2.7. Most Frequent Keywords

The ten most frequent author keywords and keywords-plus occurrences are listed in Table 9. It can be seen that “bank risk” was repeated 129 times as the most frequent keyword used by authors, followed by “bank risk-taking”, repeated 61 times. Table 9 indicates that the most important keywords used in the research field of bank risk include “risk management”, “monetary policy”, “financial crisis”, and “corporate governance”.

**Table 9.** The Ten Most Frequently Used Keywords.

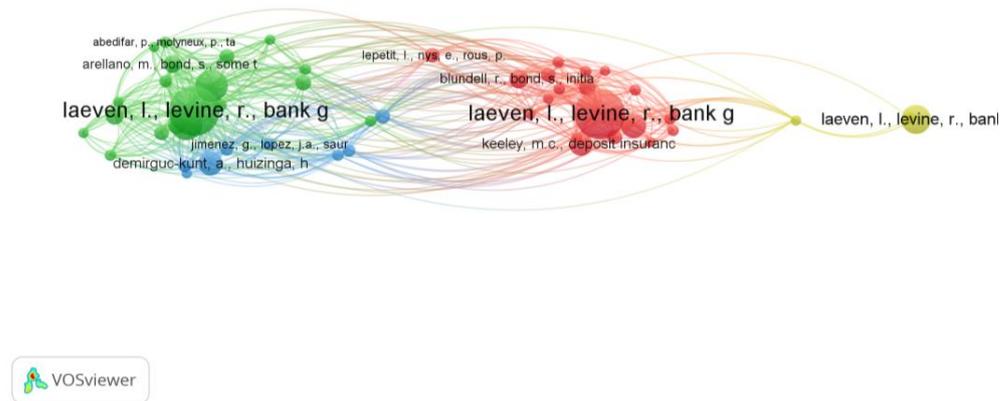
Author Keywords	Occurrences	%	Keywords-Plus	Occurrences	%
Bank Risk	129	27.56	Banking	47	37.60
Bank Risk-Taking	61	13.03	Risk Assessment	36	28.80
Banks	49	10.47	Risk Management	18	14.40
Risk-Taking	43	9.19	Commercial Bank	12	9.60
Risk Management	33	7.05	Financial Crisis	12	9.60
Financial Crisis	32	6.84	Financial Market	11	8.80
Monetary Policy	31	6.62	China	10	8.00
Risk	31	6.62	Finance	9	7.20
Banking	30	6.41	Risk Taking	9	7.20
Corporate Governance	29	6.20	Empirical Analysis	8	6.40
Total	468	100	Total	125	100

#### 4.3. Network Analysis

This study uses the “Biblioshiny” package in R and VOSviewer software to analyze the co-citation network and construct a research atlas of authors, institutions, and countries. Network analysis is divided into four sub-sections: co-citation analysis, collaboration analysis, three-field plot analysis, and historiographic analysis.

##### 4.3.1. Co-Citation Analysis

According to ref. [165], the co-citation link is based on the authors who cite the articles. Once two articles are cited in a third article, a link is built between the two articles. Based on data extracted from the Scopus database, co-citation analysis was performed by limiting the number of articles to 50. Figure 4 visually exhibits the links among the top 50 most cited papers. As shown in Figure 4, the co-citation map categorizes selected publications into three clusters: green, blue, and red.

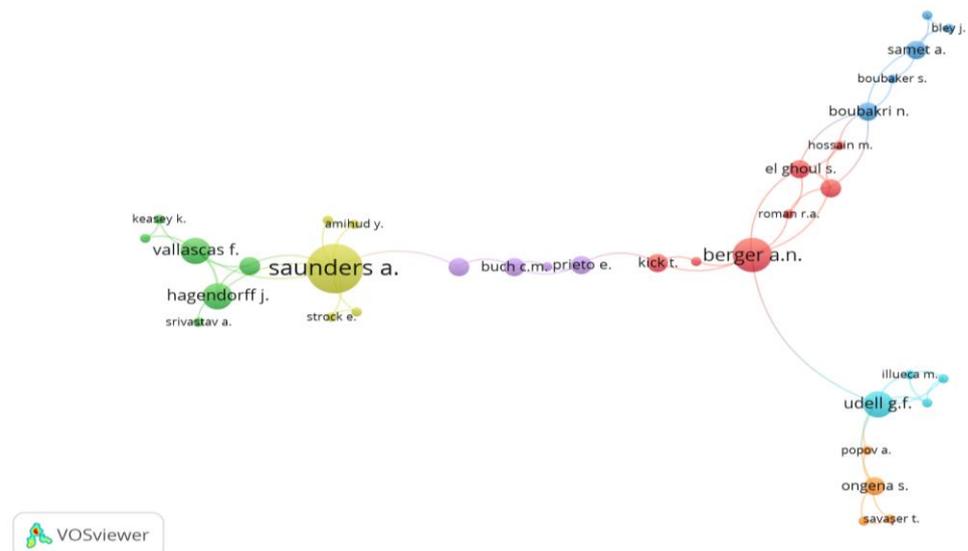


**Figure 4.** Network showing most co-cited articles.

#### 4.3.2. Collaboration Analysis

Collaboration analysis was performed to detect links between authors, affiliations, and countries. The number of nodes was limited to 50 for author and affiliation maps, while for country maps, it was limited to 30.

Figure 5 illustrates the author collaboration network with links representing co-authorships and nodes representing the authors. The ten clusters in the network show a strong collaboration among the authors in each cluster; however, the network revealed some other authors who were isolated, reflecting the heterogeneity between them and other clusters. It is worth noting that the size of the text refers to the frequency of publications; that is, the larger the text size, the more co-authored publications.



**Figure 5.** Author Collaboration Network.

Figure 6 shows the affiliation collaboration network, displaying four clusters with strong collaboration among the institutions included in each cluster and some isolated institutions having links with others.

Figure 7 shows the collaboration network among countries. This network categorizes countries into four main clusters, with strong collaboration between the United States and China in the red cluster. A strong partnership exists between the United States in the red and the United Kingdom in the blue clusters.

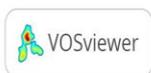
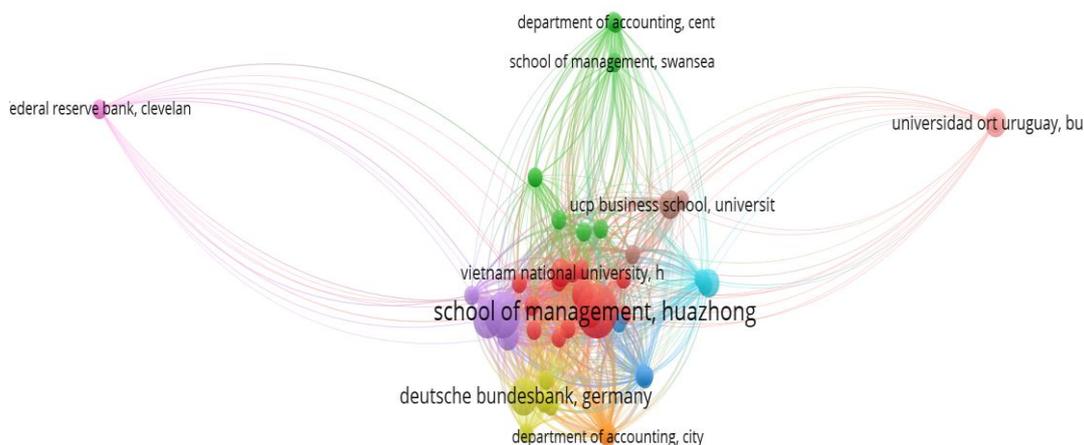


Figure 6. Institution Collaboration Network.

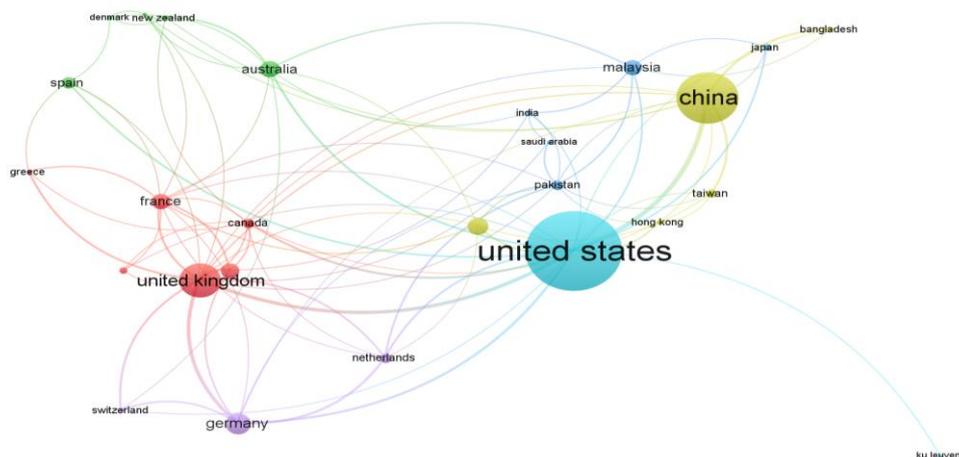


Figure 7. Country Collaboration Network.

### 4.3.3. Historiography

Figure 9 depicts the historiographic analysis of the collected contributions based on the direct citation network, where circles represent the nodes and arrows represent the directions of the citation. Linkages can be drawn in chronological order based on direct citations.

### 4.3.4. Three-Field Plot

The three-field plot (authors, affiliation, and country) is shown in Figure 8. The authors are positioned on the left (with nodes limited to 30), affiliations in the middle, and country on the right (with nodes limited to 20). From this plot, the principal authors working in each institution in each country researching bank risk were easily extracted.



exposures [9]. According to ref. [10], a deep comprehension of different risks is vital for banks to set the appropriate risk management strategies to mitigate those risks.

Table 3 shows that “Ashraf B.N.” is the most productive author, with seven publications (238 citations) from 2016 to 2020. His papers cover different topics, including bank risk-taking, capital, and efficiency [169–174]. Table 3 indicates that “Zhang J.”, “Dellis M.D.”, and “Li J.” are in second place with 15 papers (5 each). “Zhang J.” concentrates on bank risk in China, and his articles have 91 citations [175–177]. “Dellis M.D.” has the highest number of citations (702), and his contribution to bank risk-taking, efficiency, and capital research in China is noticeable [161,164,178]. “Saunders A.”, with four papers covering bank risk-taking, bank lending channels, mergers and acquisitions, and bank capital research, secures second place among the top cited authors (with 685 citations).

Table 4 demonstrates that the most cited paper is [157]. This paper reviews the literature and concludes that moral hazard is amplified and banks tend to take on more risk when competition increases intentionally. Reference [157] also shows that the positive relationship between the number of bank competitors and risk taking is fragile. The second most cited paper, ref. [158], investigates the relationship between bank ownership structure and risk taking. It concludes that stockholder-controlled banks exhibit significantly higher risk-taking patterns than managerially controlled banks during relative deregulation (1979–1982). Moreover, Table 4 shows that ref. [159] clarifies the relationship between collateral and credit risk, and it is the third most cited paper. Empirical evidence from ref. [159] reveals that collateral is associated with riskier borrowers, loans, and banks.

Furthermore, ref. [160] discusses the relationship between bank risk-taking and uncertainty measured by the disagreement between major bond-rating agencies (Moody’s and Standard and Poor’s (S&P)). Reference [160] draws on the concept that “banks are black boxes” as money goes in and money goes out, but outsiders’ risks taken in the intermediation process are hard to observe. This opacity and uncertainty represent stimuli for governments to regulate banks to protect people’s money and avoid systemic risks.

The potential impact of a bank’s board structure on risk taking was examined in [95]. Its results indicate that solid boards positively impact bank risk-taking, whereas bank risk-taking is negatively affected when the bank has a CEO who can control board decisions. Although the number of annual articles is exponentially increasing, all papers listed in the top ten were published before 2012 [95].

Regarding the country of origin of publications, Table 6 shows that developed countries were ahead as the most productive countries with publications covering the topic of bank risks, and the United States made the most contributions. China, Malaysia, and Pakistan represent developing countries in the top ten productive countries. These results are not surprising because eight of these ten countries represent the most economically influential countries in the world and are members of the Group of Twenty (G20), which addresses global financial stability and economic issues. The G20 pays great attention to research on financial institutions and sets their economic regulations.

As shown in Table 7, the most productive affiliation is the Southwestern University of Finance and Economics (China), with 12 publications, followed by the University of Economics Ho Chi Minh City (Vietnam), with 11 publications. Bangor University (UK) placed third, sharing the spot with Huazhong University of Science and Technology (China), Jinan University (China), and Renmin University of China (China), with approximately nine publications each. However, there is a need for more research by affiliations in developing countries to examine whether the context (culture, education, traditions, religion, daily life aspects, etc.) could affect the risk-taking behavior of banks and individuals.

Table 8 indicates that the *Journal of Banking and Finance* is the most productive journal. It published 49 research articles on bank risks with 2874 citations, the highest number of citations among all journals. Its first publication in bank risk was in 1978 when the study of ref. [156] discussed the impact of limiting rates paid on time and savings accounts on bank risk. There was fierce competition among US banks to attract corporate and household customers after the 1929 crisis, leading to pushed-up rates, which forced banks

to seek riskier, high-return investments that threatened the solvency of banks and the entire banking system [156]. At that time, the Federal Reserve intervened with the Banking Acts of 1933 and 1935 to set a specific limit on interest rates. The *Journal of Financial Stability*, with 18 articles and 1203 citations, is the second most productive journal. In 2008, it published the first paper on bank risk, which examined the impact of solid/weak banks' supervisory institutions on overall banking risk [179]. The *Journal of Financial Services Research* is the third, with 17 publications (688 citations), and its first bank risk-taking paper was published in 1994 [180].

Table 9 indicates that aside from the main keywords of “bank risk” and “bank risk-taking”, other keywords such as “risk management”, “monetary policy”, “financial crisis”, and “corporate governance” emerged and found their place in the top 10 list. The high frequency of the keyword “risk management” reflects the concern of academics and researchers in determining the most appropriate risk management practices needed and applied to mitigate bank risks. This concern can be justified by the significance of bank risks and how they affect the banking sector and economy [160]. This effect appeared clearly during the financial crisis of 2008, when the collapse of the Lehman Brothers bank in September 2008 was the first spark leading to the global financial crisis [181]. In addition, the appearance of the keyword “corporate governance” reflects the attention given by researchers regarding how bank regulators force banks to establish robust corporate governance frameworks—as an internal control tool—that help banks achieve their objectives without excessive risk-taking practices [179].

The co-citation analysis results are shown in Figure 4. In the green cluster, ref. [94] was the most cited article. In the red cluster, ref. [42] was the most cited paper. Finally, ref. [182] was the most co-cited article in the blue cluster. The results of the bibliometric analysis reflect the growing attention directed toward the domain of bank risk-taking, including the spread of the COVID-19 pandemic and its impact on all aspects of human life over the last three years.

Collaboration among various authors, institutions, and countries reinforces the importance of this research area. The collaboration analysis used the author, affiliation, and country as the basic units of analysis. Figure 5 shows that there is a strong collaboration between “Zheng, C.” and “Ashraf, B. N.” from Huazhong University of Science and Technology in China and “Qian, N.” from Jiangxi University of Finance and Economics. This collaboration between the two universities is evident in Figure 6.

There is also a strong collaboration between “Cheng, M.”, “Zhang, J.”, and “Geng, H.” from the same affiliation of the Xi’an Jiaotong University in China. Likewise, the link between “Li, J.”, “Li, G.”, “Zhu, X.”, “Wei, L.”, and “Wu, D.” from the Chinese Academy of Sciences reflects a strong collaboration between those authors from the same affiliation. Another collaboration is between “Gamabacorta, L.” from Bank for International Settlement in Switzerland, “Altunbas, Y.” from Bangor University in the United Kingdom, and “Marques-Ibanez, D.” from the European Central Bank located in Germany. This collaboration is also reflected in the countries' collaborations, as shown in Figure 7.

Figure 7 shows a strong collaboration between the USA and China. It took place between “Wu, J.” from the Southwestern University of Finance and Economics in China, “Wang, R.” and “Luo, N.” from Xihua University in China, “Chen, M.” from Xi’an Jiaotong University in China, and “Jeon, B.N.” from Drexel University in the USA.

In Australia, the link between “Haq, M.” and “Faff, R.” demonstrates the collaboration between the University of Queensland and Bond University.

Finally, Figure 5 indicates that the collaboration between “Thronton, J.” from Norwich Business School of East Anglia University and “Altunbas, Y.” from Bangor University is a strong collaboration between the two institutions.

## 6. Conclusions

In the current study, a bibliometric analysis of a sample of 671 publications from 1978 to 2022 was performed to assess the diversity of the literature on bank risk. Co-authorship

analysis, citation analysis, keyword co-occurrence analysis, bibliographic coupling analysis, and co-citation mapping analysis were only some of the relational methods used in the bibliographic study of the existing literature on the topic. Some authors have explored the acceptance and use of risk management, monetary policy, financial crisis, and ESG performance and the benefits of their implementation. Others have focused on using risk taking to measure and avoid bank risk or fraud detection.

Bibliometric and co-citation analyses provided a research front map for bank risk research streams. The main research directions are clustered into the following research areas: (1) the first topic investigates the benefits and challenges related to bank risk implementation and explores the key factors that influence a bank's plan to decrease bank risk; (2) the second topic analyzes the evolution of different architectures, software, tools, and systems used to support bank risk in the best possible way; and (3) the last topic aggregates research that examines the connections between bank risk and corporate governance. Future research directions will extend to these areas.

Interestingly, most of these publications were conducted empirically on banks worldwide, especially in the USA and China. Additionally, the information provided by the bibliographic analysis helped pinpoint the articles, sources, and authors that all used similar sets of keywords. Thus, understanding the growing interest of governments and businesses in bank risk indicators leads to the first implication.

The effectiveness of corporate governance in reducing bank risk is debatable as several studies have focused on bank risk and corporate governance, expanding this line of research, especially during the COVID-19 period. In addition, introducing fintech, Internet banking, phone banking, electronic banking, and other forms of digital banking greatly affects different bank risks such as operational, legal, reputational, market, and other risks [20]. Nevertheless, little academic attention was directed to such research areas and their effects on bank risk and its management. In this context, the COVID-19 pandemic has accelerated fintech operations that may significantly impact bank risk. Financial and health crisis-related events, such as the recent pandemic spread of COVID-19, provide an "unfortunate" opportunity as a form of quasi-natural experiments to examine various aspects of bank risk and the effectiveness of macroprudential regulations, capital requirements, the Basel regulations, and other government measures during the pandemic, as well as revisiting old research questions.

Our analysis suggests that most publications are empirical; therefore, emphasis should be placed on the theoretical contributions to bank risk research. Moreover, there is more active research on bank risk in the USA and other developed countries. However, further research and investigation are needed to explore the situation in developing countries, except for China, the second most productive country in this research field.

Specifically, the current study can help future research in several ways. First, the bibliometric analysis in our study allows for identifying key trends and patterns in the development of bank risk research. Thus, it provides insights into future research directions and the most promising areas for investigation. Second, combining multiple databases and incorporating databases such as the WoS in future studies can provide a more comprehensive picture of the literature on bank risk. Third, analyzing collaboration between authors and examining the knowledge-creation process of a specific research community can provide insights into how authors work and how their collaboration influences the field of bank risk research.

## 7. Theoretical and Practical Implications

This study has several theoretical and practical implications. For academics, this study contributes to the current understanding of the bank risk literature by providing valuable insights and trend analysis. It provides a starting point for authors interested in bank risk topics by highlighting seminal articles. It also indicates the development status of each research theme by identifying areas of study that still need to be explored. Moreover, the present study provides directions for future research by (a) emphasizing the need for

more theoretical contributions to the field of bank risk, (b) providing recommendations for potential journals for future publications in the field of bank risk, and (c) highlighting the importance of considering advancements in bank risk to improve the efficiency and effectiveness of future risk taking in maintaining the performance and stability of banks.

For practitioners, this study provides a comprehensive and updated picture of the bank risk evolution during the past four decades. Thus, a better understanding of bank risks could be helpful in risk taking and establishing proper risk management techniques to mitigate such risks. In addition, the results may be beneficial to banking regulators since they are responsible for developing risk-taking and risk-management policies and maintaining the stability of the whole industry. This research may be used rapidly by CEOs, managers, governments, central banks, and regulators, especially in the context of COVID-19, to determine the essential bank risk-taking indicators. Further, we propose a policy recommendation that developed economies and controlling bodies start funding research projects for reducing risk taking and achieving financial stability in developing countries.

## 8. Limitations and Future Research

However, the current study has several limitations. First, our findings are only based on one particular keyword, implying that the search query results for the other fields in the abstract and keywords are not included in the analysis. Therefore, upcoming studies could consider adding different keywords in the abstract and keywords. Second, the data were collected in October 2022; therefore, we have a limited overview of scientific production in 2023. Third, the scope of the analysis is limited to publications indexed in Scopus. Although Scopus is one of the top leading extensive comprehensive databases, future research can expand its range. However, future studies may consider other databases or a merged dataset from a mix of databases, which could increase the outcome and contribution of these studies. Another limitation is that we depended on the bibliometric approach only to investigate the bank risk discipline.

Further research can overcome such limitations by following a stricter systematic literature review approach by combining bibliometric and content analysis approaches to provide a worm-eye view of the examined discipline. Finally, the broad scope of the research question on bank risk can be considered a limitation as it may not allow for a detailed and specific analysis of a particular aspect of bank risk. The broad research question may result in a less focused and specific conclusion, which may limit the study's practical implications.

Future studies may consider narrowing the research question to a more focused and specific aspect of bank risk. This would allow for a deeper and more detailed analysis of the chosen aspect and potentially lead to more significant and practical implications. In addition, future studies may utilize the bibliometric coupling method for different topics, including ESG performance, geopolitical risk, incentives, sustainable banks, religiosity, opacity, and cash holding during the pandemic. Thus, the understanding of issues related to bank risk and how they may influence future risk taking can be furthered. While the current study has focused mostly on banks in the USA and developed countries, future research could explore the situation in developing countries. Given that most of the publications analyzed in the current study are empirical, future research could place more emphasis on making theoretical contributions to the field of bank risk, helping to advance our understanding of the topic.

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