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Investigation of the Studies in the Field of Banking Risk Management via the Social Network Analysis

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Bankacılık Risk Yönetimi Alanındaki Çalışmaların Sosyal Ağ Analizi ile İncelenmesi

Abstract

This study aims to examine the studies published between 2010 and 2020 in banking risk management from a bibliometric perspective and to reveal the tendencies and trends within the last decade. In this context, the bibliometric data of the studies indexed in the Web of Science Core Collection Database are obtained. The social network structure is revealed using the CiteSpace 5.5 software. According to the results of the analysis, the US-based Journal of Banking and Finance is concluded as the most frequently cited journal, where the USA has played a key role in country cooperation, and 'management', 'risk', and 'risk management' have been the most frequently used concepts.

Keywords : Bank, Banking Risk Management, Bibliometry, Social Network Analysis, CiteSpace.

JEL Classification Codes : G21, G32, G33.

Öz

Çalışmanın amacı, bankacılık risk yönetimi konu alanında 2010-2020 yılları arasında yayımlanan çalışmaları bibliyometrik açıdan inceleyerek konu alanında son 10 yıldaki eğilim ve trendleri ortaya koymaktır. Bu kapsamda web of science core collection veri tabanında indekslenen çalışmaların bibliyometrik verilerine ulaşılmış ve CiteSpace 5.5 programı kullanılarak sosyal ağ yapısı ortaya çıkarılmıştır. Analiz sonuçlarına göre, çalışmalarda ABD'nin ülke işbirlikteliklerinde kilit rol oynadığı, ABD menşeli *the Journal of Banking and Finance* isimli derginin çok atıfta bulunulan dergi olduğu, en sık kullanılan kavramların ise 'management', 'risk' ve 'risk management' olduğu sonucuna ulaşılmıştır.

Anahtar Sözcükler : Banka, Bankacılık Risk Yönetimi, Bibliyometri, Sosyal Ağ Analizi, CiteSpace.

1. Introduction

The emergence of new investment alternatives, globalisation in international financial markets, and the increasing uncertainty and competitive environment with market volatility have resulted in the spread of risks throughout the financial sector. Due to the financial liberalisation and liberalisation of interest rates within the last three-four decades, the importance of banking risk management has increased even more, and studies conducted in this field have concentrated more on the extent to which risks are identified, measured, reported, and managed (Van Liebergen, 2017; Helbekkmo et al., 2013; Oliver Wyman, 2017; Deloitte University Press, 2017). McKinsey Quarterly stated that risk functions in banks should be defined differently than today by the end of 2025. It is emphasised that according to customer expectations, there will be a need for expansion and new regulations concerning risk types. This situation is expected to cause changes in risk management.

Due to the development of technologies utilised in the banking sector, the scope of risk management also expands depending on these developments. In this regard, it is crucial to analyse the content of scientific research studies in banking risk management and the overall situation in the field. In the studies conducted accordingly, the absence of studies that thoroughly analyse the general situation of the field is observed. The study is undertaken to mitigate such deficiency. The study's primary purpose is to perform a bibliometric analysis of scientific research studies conducted within the last decade in the field of banking risk management and to determine the direction of scientific development in the field. The detailed objectives of the study are to determine the social network structure of the field of banking risk management and to determine the identities of effective researchers or groups. Network structures such as word analysis, journal citation analysis, source citation analysis, and author citation analysis are revealed to determine the most researched subjects.

The study seeks responses to specific questions. The study addresses the following questions: (1) How is the distribution of the studies published in the field of banking risk management according to the country? (2) What are the word and keyword network structure, journal citation structure, and author co-citation structure? These questions are analysed with statistical data and visualised with the social network structure. The data sources of the research study are obtained through the Web of Science Core Collection database. Web of Science is the database used by the scientific world that makes significant contributions to bibliometric studies. In the study, it is tried to reveal the science map of scientific publications by examining the studies in the field of banking risk management as a whole via the Web of Science database. The study is predicted to become quite comprehensive in this respect and provide the researchers studying banking risk management with specific ideas. This circumstance constitutes the primary motivation for the study.

2. Literature Review

2.1. Risk Management in Banking and its Classification

Risk in the financial sector is described as the possibility of incurring losses or being exposed to risks in terms of returns and market value due to uncertainties (Bessis, 2002; Sirbulescu, 2016; Kupper, 2000). Financial risks mainly stem from technological, social and political changes. Besides their positive impacts, the change in existing dynamics has caused the dimensions of existing risks to change and led to risk diversification (Jorion & Khoury, 1996; Gleason, 2000).

There are many risk mitigation strategies in the banking sector. According to Santomero (1997), there are three risk management strategies; risk elimination, risk transfer, and risk reduction. Risk elimination includes suggestions for terminating the risk. Risk transfer is shifting the risk to other parties outside the organisation. Risk reduction involves conducting effective risk management activities to reduce risk within the organisation. Financial institutions should identify their risk exposure potentials and define the risk. In the next stage, appropriate evaluation and control strategies should be determined (Cumming & Hirtle, 2001).

Risk management must classify the risks to reveal, control, and render them measurable (Bessis, 2002). Basel Committe (2001) classified the risks to which banks are exposed, such as market risk, liquidity risk, credit risk, and operational risk. Market risk refers to the probability of value loss of financial instruments and positions held by banks in their current period due to fluctuations arising from market conditions other than their activities (Jorion, 2007). Market risk covers interest rate risk, exchange rate risk, stock risk, and commodity price risk. Interest risk is the risk of losing the expected rate on the return of investment due to changes in interest rates (Saunders & Connett, 2002). Exchange rate risk has an important share in market risks. The value loss might have occurred due to the fluctuations in exchange rates due to the foreign exchange short positions of the banks (Basel Committe, 2011). Stock price risk is the possibility of depreciation in stock prices due to capital market volatility. Commodity risk is the probability of loss due to price movements based on the position of the commodity and commodity-based derivative financial instruments.

Liquidity risk, considered separately from other risks, is the lack of banks to provide sufficient cash inflow to fulfil their cash outflows (Jorion, 2007). This risk is critical for banks as they need liquidity to fulfil their obligations. It emerges due to the lack of sufficient resources in banks' balance sheets to meet the increase in their assets. Credit risk, as another type of risk, involves the risk that the bank customers fail to fulfil their obligations wholly or partially by not complying with the contract. Credit risk is the type of risk most frequently encountered by banks (Apostolik et al., 2009). International studies are conducted, and standards are developed to minimise credit risk as low as possible. The World Bank's International Committee on Credit Reporting published the first standards in 2011. Since the

cause of credit risk is credit. Such risk begins with the loan application and approval from the credit department, which evaluates the client's data and provides a risk profile for the application (Brown, 1998; Richard et al., 2008). Therefore, it is crucial to establish international standards to reduce credit risk. Another type of risk that banks should consider separately is operational risk. Operational risk is defined as the loss that may be incurred due to insufficient or unsuccessful internal processes involving human resources and technological systems or even external circumstances. Human-induced risks involve staff failure and insufficiency, corporate culture, and conflicts of interest. Process-based risks involve business continuity, legal regulations, confidentiality, and strategy. Risks stemming from the information systems are pertinent to communication, information, hardware, and software. Risks arising from external circumstances originate from the state, industry, natural disasters, and society (Basel Commite, 2011). The various risk types of banks and their subclassification are illustrated in Figure 1.

Figure: 1
Risk Taxonomy

2.2. Bibliometric and Other Studies in the Field of Banking Risk Management

Bibliometric research has recently attracted a great deal of attention to evaluate the quality of research in specific fields and to reveal improvement. Upon examining the bibliometric studies conducted in the field of banking risk management, it is seen that the dimensions of the subject and the general situation of the field have not been comprehensively handled. It is observed that the studies were mostly limited to certain areas and quite a few in the literature. In one of the studies conducted on the subject, Hao and Min (2012) examined the financial risk literature by explicating 2,727 studies in the Web of Science database over the years 1970-2009. The study concluded that the financial risk literature in Asia increased between 1997-1998 due to financial fluctuations. The highest point was reached due to global financial crises between 2007-2009.

Moreover, it was emphasised that the studies in the financial risk literature were primarily written in English, and most were conducted in the USA. Prado et al. (2016) examined the studies conducted on credit risk and bank bankruptcy in the Web of Science database from 1968-2014 using the multivariate analysis method. The study concluded that the studies conducted on neural networks have been intense in measuring credit risk and bankruptcy risk since the 1990s. Carlsson et al. (2017) investigated customers' credit behaviour bibliometrically along with digitalisation. It was concluded that the research trend was intense in financial management, data management, marketing, and risk management. Scacun and Voronova (2018) performed a bibliometric analysis of financial risk for the Baltic countries. In this context, publications made in the Baltic countries from 2005-2017 obtained from Scopus and Web of Science databases were examined. The study concluded that there was an increase in the number of research studies on financial risk throughout the periods during which the bankruptcy risk of the enterprises increased.

Besides, due to the multidisciplinary nature of the subject, the wide range of scientific journals in which relevant studies were published was emphasised. Shi and Li (2019) conducted a bibliometric analysis using the methods of estimating the bankruptcy risk of institutions. The subject was examined in the Web of Science database from 1991-2018. It was determined that the number of publications on bankruptcy risk increased along with the 2008 financial crisis. It was concluded that research on bankruptcy risk modelling in finance, business management, and computer science is intense. The People's Republic of China and the USA have conducted seminal studies in the field. Bahoo (2020) conducted a bibliometric analysis on operational risk in banks. 819 articles on banking corruption were accessed from the Web of Science database and analysed over 1969-2019. As a result of the research study, it was stated that most research studies on the subject were conducted in the USA and England.

Furthermore, it was concluded that the research concentrated on the determinants of credit corruption in banks and the impact of corruption on banks' credit and operational risks. Liu (2020) conducted a bibliometric analysis of internet finance credit from 2000-2018. It was concluded that research trends such as risk, online lending, credit risk in

traditional finance, internet financial credit system, credit, and supervision of internet financial credit risk were divided into clusters.

It is also observed that studies on the identification, measurement and management of risks have been conducted in banking risk management. Some of the studies conducted in this field are as follows.

Pathan (2009) analysed the relationship between banks' board of directors and the banks' risk-taking structures. According to the results of the research, it is concluded that banks with smaller and less restrictive boards tended to take higher risks. Laeven and Levine (2009) analysed the relationship between banks' risk-taking behaviours and national bank regulations. The research results concluded that national banking regulations had different impacts on banks' risk-taking behaviours and led to changes in their capital structures. Aebi et al. (2012) analysed the corporate management of banks and their risk management performances during financial crises. The research results concluded that the banks whose risk management department reported directly to the board of directors performed significantly better during financial crises. Beltratti and Stulz (2012) analysed the impact of credit risk on the banks' performances. The research results concluded that banks financed with short-term funds exhibited more fragile features during the crisis. In their study, Ellul and Yerramilli (2013) developed a risk management index to measure the strength and independence of the risk management functions of banks. The research results concluded that strong and independent risk management enhanced the efficiency and productivity of the banks.

It is seen that studies investigating the field of banking risk management have been bibliometrically conducted in 2010 and after. It can be claimed that the main reason for this is that the studies have increased following the year 2012. The current bibliometric literature does not comprehensively analyse certain aspects of banking risk management as well as the overall situation of the field. The primary factor for this study is that bibliometric studies are very limited in the literature.

3. Data and Research Methods

3.1. Data Sources

The research dataset consists of 3,806 studies published in 2010-2020 in banking risk management and cited in the Web of Science database. The "title" option is selected as the research method in the Web of Science Core Collection database to obtain research data. The keyword search is carried out with the concept of "banking risk management". Bibliometric data were obtained, such as publication types, publication languages, titles, author names, countries, citation information, keywords, bibliography, and abstract. Research data are saved in files with ".ris" and ".txt" extensions.

3.2. Methodology

The study aims to perform a bibliometric analysis of scientific research studies conducted in banking risk management over the years 2010-2020 and to determine the direction of scientific development in the field. The bibliometric data in the survey is visualised through the CiteSpace (5.5 R2 version 64-bit) software, and a social network analysis of the data is performed. The CiteSpace software is a Java-based application used to visualise and analyse trends and patterns in the scientific literature (Chen, 2006).

Social network analysis is an interdisciplinary field of study, and interest in this approach is increasing daily with the development of analysis techniques in recent years (Bott, 1957: 60). The main reason for such an increase involves the social actors in the analysis and the developments in computer technologies that allow their social relations to be analysed and perform complex network analyses (Streeter & Gillespie, 1992: 204).

In the study, network density, modularity Q value of the network, and mean silhouette values are calculated as a result of the social network analysis. Network density indicates the ratio of all existing connections to the maximum potential connections (Gürsakal, 2009). Hence, network density suggests the social network's inclusiveness. The modularity Q of the network measures whether or not the modules of a network are divided into independent blocks. The modularity Q value usually ranges between 0 and 1. A value close to 1 indicates a well-structured network. The mean silhouette value usually ranges between -1 and 1. This value, being close to 1, is crucial for a robust clustering (Chen et al., 2010: 8-29). The mean silhouette is the value used for determining the optimal clustering number (Simovici, 2007: 212).

Publications, authors, and country productivity indicators were used as productivity criteria in the study, whereas bibliometric techniques are used as impact measurement by citation analysis. Accordingly, co-citation sources, country collaborations, journals, author, and word analyses are evaluated according to the centrality value in the network. According to Ataman and Çelik (2018), centrality is a measurement that allows the ranking of the actors in the network for comparison. The high centrality serves as a bridge connecting the nodes (Ni et al., 2017).

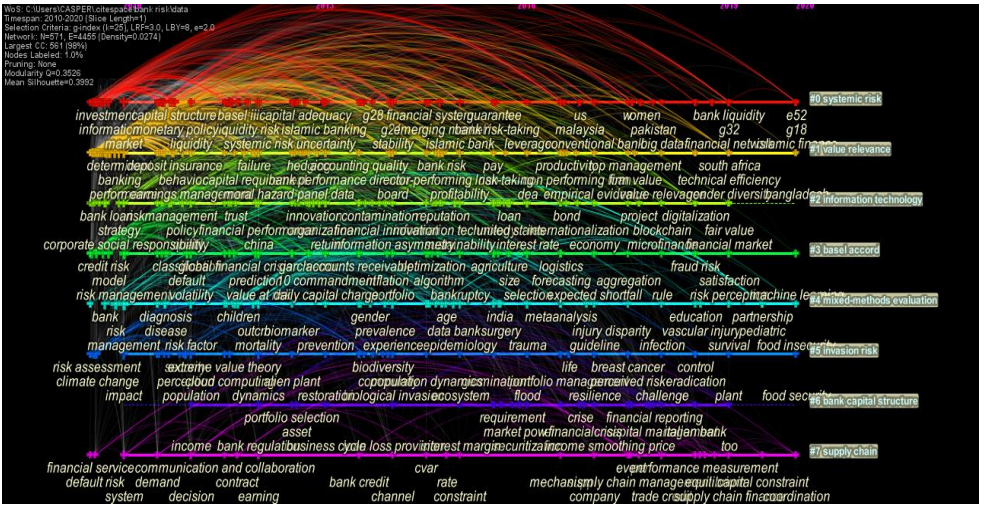
4. Results

4.1. Word Analysis

Social network analysis is conducted to identify frequently used keywords in studies published in banking risk management. As a result of the analysis, statistical values regarding the network are calculated. The publications' abstracts and keywords are considered in the calculation. As a result of the study, a network consisting of 571 nodes and 4,455 connections is obtained. The web is divided into 8 clusters, and the network density is calculated as 0.027. Each node denotes a keyword. The connection indicates the relationships among words. As the number of connections increases, the connections among

nodes become thicker, which is interpreted positively in the network relationship. The modularity Q value of the network is 0.35, and the mean silhouette value is 0.39. According to empirical studies, the modularity Q value must be higher than 0.3. It can be claimed that the network formed in the study is well structured. Statistical results along with the network are illustrated in Figure 2 in detail.

Figure: 2
Timeline of Keywords in Banking Risk Management



Upon considering the degrees of centrality in word analysis, it is seen that the concepts of competition (0.89), determinant (0.84), firm, and diversification (0.74) have the highest centrality values. The words with the highest frequency ratings include management (n = 654), risk (n = 504), risk management (n = 448), and bank (n = 290). In this context, it can be claimed that concepts have a key role in the studies conducted in the field. Table 1 presents the words with the highest frequencies and degrees of centrality.

Table: 1
Co-Citation Keyword Analysis

Citation Counts	Keywords	Centrality	Keywords
654	management	0.89	competition
504	risk	0.84	determinant
448	risk management	0.74	firm
290	bank	0.74	diversification
253	model	0.69	efficiency
236	performance	0.64	ownership
204	determinant	0.61	market
204	banking	0.61	behaviour
188	impact	0.61	deposit insurance
178	credit risk	0.61	capital structure

Citation burst determines whether or not a particular author, country, or study has statistically significant fluctuations in the number of citations in a given period (Chen et al., 2010). Upon considering the citation burst values of the words, the word with the highest citation burst (9.32) is the word "value at risk" over the years 2012-2014. Table 2 presents the citation burst values of the words by the years.

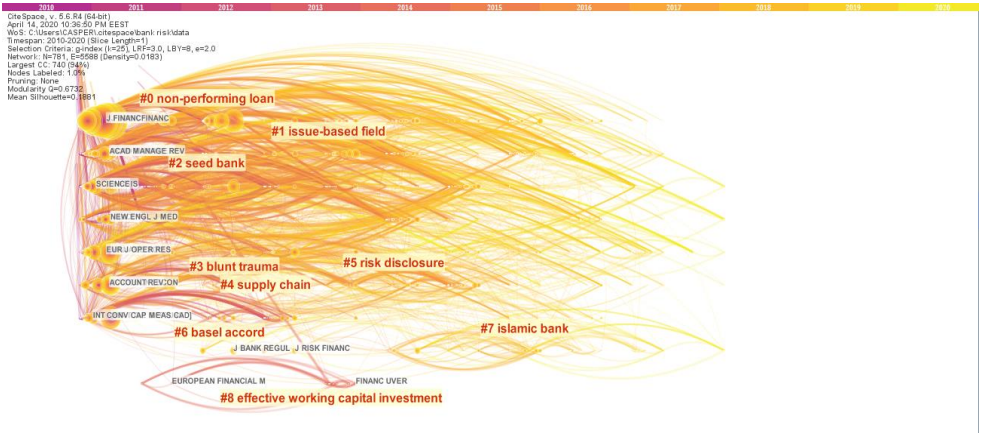
Table: 2
Citation Burst Values of the Keywords

Keywords	Strength	Begin	End	2010-2020
Value at risk	**9.32**	2012	2014	
Trade credit	**8.31**	2018	2020	
Operational risk	**7.12**	2010	2013	
Data bank	**5.47**	2015	2016	

4.2. Journal Co-Citation Network

It is aimed to determine the journals in which the studies on banking risk management have co-cited and published critical scientific studies in the field. As a result of the analysis, a network consisting of 781 nodes and 5,588 connections is obtained. The network is divided into 9 clusters, and the network density is calculated as 0.018. Each node denotes a journal, and the connections indicate journal relationships. The modularity Q value of the network is 0.67, whereas the mean silhouette value is 0.18. As a result of the modularity Q value, it can be claimed that the web is well-structured. Statistical significances of the network are illustrated in Figure 3.

Figure: 3
Timeline of Journal Co-Citation Network in Banking Risk Management



"The Journal of Banking and Finance" is the most-cited journal (n = 1,237) of the studies published in banking risk management. "The Accounting Review" is the journal with the highest degree of centrality (0.56) in the network. The fact that the web is mainly

highlighted with orange indicates that the studies have been utilising up-to-date sources. The journals with the highest frequencies and degrees of centrality are presented in Table 3.

Table: 3
Co-Citation Journal Analysis

Citation Counts	Journals	Centrality	Journals
1237	J BANK FINANC	0.56	ACCOUNT REV
1063	J FINANC	0.52	J ACCOUNT ECON
903	J FINANC ECON	0.51	J CORP FINANC
651	AM ECON REV	0.50	J BUS ETHICS
592	REV FINANC STUD	0.50	BRIT ACCOUNT REV
519	J MONEY CREDIT BANK	0.48	J FINANC SERV RES
493	J FINANC INTERMED	0.47	J BANK FINANC
475	WORKING PAPER	0.46	J MONEY CREDIT BANK
436	J POLIT ECON	0.45	J FINANC
434	ECONOMETRICA	0.45	J FINANC INTERMED

Upon considering the citation burst values of the journals, "The Journal of Business" has the highest citation burst value (13.91). Table 4 presents the citation burst values of the journals by the years.

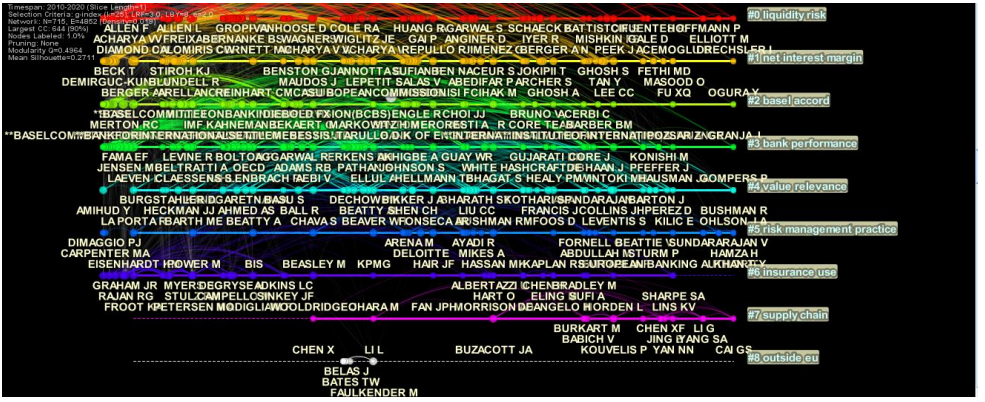
Table: 4
Citation Burst Values of the Journals

Journals	Strength	Begin	End	2010-2020
THE JOURNAL OF BUSINESS	**13.91**	2010	2012	▬▬▁▁▁▁▁▁
VALUE RISK NEW BENCH	**9.75**	2010	2015	▬▬▬▬▁▁▁▁
FINANCIAL ANAL J.	**8.04**	2010	2013	▬▬▬▬▁▁▁▁
MATH FINANC	**6.07**	2010	2012	▬▬▁▁▁▁▁▁

4.3. Author Co-Citation Network

A co-citation network is established for the authors with the highest contribution to the studies published in the field. There are 715 nodes and 4,852 connections in the network. The network is divided into 9 clusters, and the network density is 0.019. The modularity Q value of the network is 0.49; whereas the mean silhouette value is 0.27. Network results are illustrated in Figure 4.

Figure: 4
Timeline of Author Co-Citation Network in Banking Risk Management



The most cited authors in the studies included in the analysis are those whose names could not be determined under the name of Anonymous (n = 603) and Allen N. Berger (n = 411). Upon considering the degree of centrality, the author with the highest value is Laeven Luc. The authors with the highest frequencies and degrees of centrality are presented in Table 5.

Table: 5
Co-Citation Author Analysis

Citation Counts	Authors	Centrality	Authors
603	Anonymous	0.89	Laeven L.
411	Berger A.N	0.83	Jensen M.C
287	Basel Committee on Banking Supervision	0.81	Acharya V.V
241	Diamond D.W	0.72	Flannery M.J
230	Laeven L.	0.72	Fahlenbrach R.
200	Jensen M.C	0.72	John K.
195	Acharya V.V	0.71	Diamond D.W
193	Merton R.C	0.68	Barth J.R
186	Allen F.	0.65	Berger A.N
169	Demirguc-Kunt A.	0.64	Smith C.W

Upon considering the burst values of the authors, it is seen that the highest value (11.15) belongs to the author named R.A. Jarrow over the years 2010-2014. Table 6 presents the citation burst values of the authors by the years.

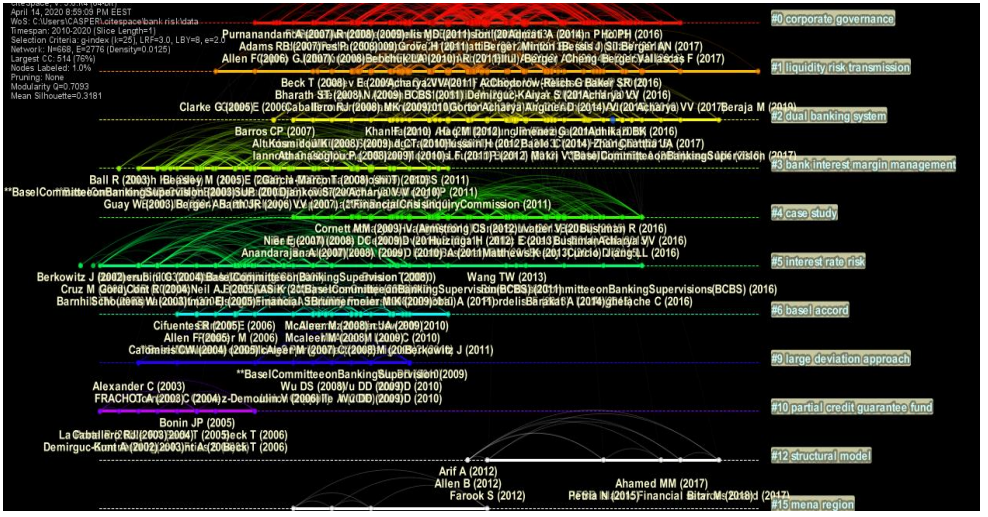
Table: 6
Citation Burst Values of the Authors

Authors	Strength	Begin	End	2010-2020
Jarrow R. A	**11.15**	2010	2014	▬▬▬
Anonymous	**10.03**	2010	2014	▬▬▬
Embrechts P.	**8.75**	2010	2013	▬▬▬
Basel Committee on Banking Supervision	**8.60**	2010	2011	▬▬

4.4. Source Co-Citation Network

As a result of the source co-citation network analysis, the network consists of 668 nodes and 2,776 connections. The network consists of 11 clusters, and the network density is 0.012. The modularity Q value of the network is calculated as 0.70; whereas the mean silhouette value is 0.31. Statistical information regarding the network is illustrated in Figure 5.

Figure: 5
Timeline of Source Co-Citation Network in Banking Risk Management



The article entitled "Risk management, corporate governance, and bank performance in the financial crisis" (n = 81) was published in 2012 by Vincent Aebi, Gabriele Sabota, and Markus Schmid in cluster # 0 and is the most cited source in banking risk management studies. It can be said that this study is a citation source for studies conducted on banking risk management in 2012 and later. The sources with the highest citation value are presented in Table 7.

Table: 7
Frequency Values of Citation Sources

CC	References	Year	Corresponding Author	Cluster #
81	*Risk management, corporate governance, and bank performance in the financial crisis*	2012	Vincent Aebi	0
78	*Bank governance, regulation, and risk-taking*	2009	Luc Laeven	3
70	*The credit crisis around the globe: Why did some banks perform better?*	2012	Andrea Beltratti	0
63	*Stronger Risk Controls, Lower Risk: Evidence from U.S. Bank Holding Companies*	2013	Andrew Ellul	0
61	*Bank CEO incentives and the credit crisis*	2011	Rüdiger Fahlenbrach	0

Note: CC (Citation Counts).

Upon evaluating the sources according to the citation bursts, it is seen that the source with the highest value is the article entitled "Bank governance regulation and risk-taking" (9.18), written by Luc Leaven and Ross Levine in 2009. Table 8 presents the burst values of the sources by the years.

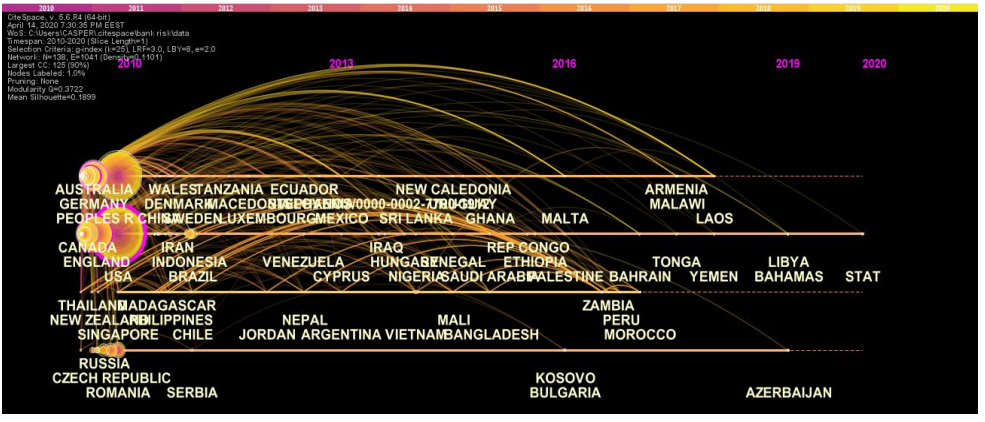
Table: 8
Citation Burst Values of Sources

Author &References	Strength	Begin	End	2010-2020
Luc Laeven, Ross Levine, Bank governance, regulation and risk-taking, Journal of Financial Economics, Volume 93, Issue 2, 2009	**9.18**	2011	2017	
Markus K. Brunnermeier, Lasse Heje Pedersen, Market Liquidity and Funding Liquidity, The Review of Financial Studies, Volume 22, Issue 6, 2009	**6.66**	2015	2016	
Shams Pathan, Strong boards, CEO power, and bank risk-taking, Journal of Banking & Finance, Volume 33, Issue 7, 2009	**6.63**	2014	2016	

4.5. Country Collaborations

In the study, social network analysis is performed to determine the research studies conducted by researchers in different countries. The network, formed to determine the authors' countries who mainly contributed to the banking risk management field in scientific research, has 138 nodes and 1,041 connections. The network density is 0.11. Statistical values regarding the network are found as 0.37 for the modularity Q value of the web and 0.18 for the mean silhouette value. Statistical values regarding the network are illustrated in Figure 6.

Figure: 6
Timeline of Countries' Collaborations Network in Banking Risk Management



Upon analysing the countries according to their academic studies in the field of banking risk management, it is determined that the most productive countries are the USA with 798 studies, the People's Republic of China with 538 studies, and England with 327 studies. Upon evaluating the countries according to the degree of their centrality, it is seen that the major country is the USA (0.64). According to these results, the USA is the country

where the researchers who contribute the most scientifically to the field are connected. The authors with the highest frequency and degree of centrality are presented in Table 9.

Table: 9
Country Collaborations Analysis

Citation Counts	Countries	Centrality	Countries
798	The USA	0.64	The USA
538	People's Rep. China	0.54	England
327	England	0.50	Germany
197	Australia	0.50	France
197	Germany	0.47	Australia
194	Italy	0.42	Italy
155	France	0.41	Netherlands
152	Canada	0.38	Kenya
147	India	0.37	Canada
115	Malaysia	0.36	People's Rep. China

Upon examining the citation burst values of the countries, it is seen that the country with the highest citation burst value from 2012-2015 in Romania (12.03). It is seen that the current studies published in the field are cited as sources of reference to the studies conducted by Ukrainian and Russian researchers. The citation burst values of the countries by the years are presented in Table 10.

Table: 10
Citation Burst Values of the Countries

Countries	Strength	Begin	End	2010-2019
ROMANIA	**12.03**	2012	2015	
UKRAINE	**5.87**	2018	2020	
RUSSIA	**5.32**	2018	2020	
TAIWAN	**3.94**	2011	2013	

5. Conclusions and Discussions

In this study, 3,806 scientific studies published in international citation indexes between the years 2010 and 2020 in the field of banking risk management are examined in terms of their bibliometric features through social network analysis. In this direction, the scopes and trend topics of scientific research studies in the field of banking risk management are tried to be detected. It is observed that the number of citations of scientific research included in the study tends to increase rapidly, especially with the proliferation of online databases. The obtained results are as follows.

- As a result of the word-based analysis, it is seen that the most frequently used keywords and phrases (management, risk, risk management, bank, etc.) and the most centralised words and phrases (competition, determinant, firm, etc.) are comprised of field-specific general terms in the studies conducted on the field of banking risk management. The high frequency of words means that these words are frequently used in research studies published in banking risk management. It is essential to determine the appropriate keywords for the scope of the research for the research to be easily accessible and indexed. As a result of the study, since the

keywords used are composed of more general terms specific to the field, it is thought to be a factor that makes it difficult to access the publications.

- As a result of the journal analysis, it is seen that the research studies in the subject field are published primarily in journals of banking and finance. Besides, it is seen that there are journals published in the field of accounting and business. Journal of Banking and Finance is a journal of US origin, which is mainly cited in the field of banking risk management. Nonetheless, the Accounting Review, which began to be published in the USA in 1926, is the journal in which the studies that play a vital role in the field are published. The Journal of Business is the journal with the most citation burst value in the field. Most journals in the journal citation network are published in the USA. It is seen that the USA takes the lead in scientific publishing in the field of banking risk management.
- According to the author's co-citation network analysis result, it is seen that the most citations among the authors are made to the authors whose names could not be determined under the name of Anonymous and to the author named Allen N. Berger. It can be claimed that the author named R. A. Jarrow has the most citation burst value in recent years. It is seen that the authors mainly publish in the fields of financial crisis, bank performance, and risk management.
- According to the source co-citation network analysis, the study of Vincent Aebi, Gabriele Sabato, and Markus Schmid modelling the risk management and bank performances in financial crises published in 2012 is the most cited source. The study by Luc Leaven and Ross Levine, on the other hand, is the source that guided the studies conducted from 2011-2017 and has the highest citation burst value. Nevertheless, the fact that journal and source co-citation networks are highlighted mainly by orange indicates that the studies in the field utilise current sources.
- It can be claimed that the USA is pioneering in providing scientific communication in the field and plays a key role in country collaborations. England, the second country with the highest degree of centrality, also serves as a bridge in the field. According to another result obtained in the study, Romania is the country with the highest citation burst value. In contrast, it is seen that Ukraine and Russia are the sources of citation for the current studies published in the field.

There are studies in the literature that examine specific dimensions of banking risk management. In their research of bibliometric analysis on bankruptcy risk estimation methods, Shi and Li (2019) obtained findings similar to that of our study. They stated that the USA had conducted pioneering studies in the field, and reflections on bankruptcy risk intensified after 2010. Our study concluded that scientific publications have an increasing trend following 2010, and the USA has a key role in the studies. Another study with findings similar to ours, Bahoo (2020), in his research on operational risk in banks, concluded that most studies were conducted in the USA and England and focused on credit and operational risks. In our study, it is also seen that similar issues are focused on regarding the most frequently used words and phrases in the subject field.

The study concludes that the scope of scientific research studies in banking risk management within the last decade has been concentrating on the extent to which risks are identified, measured, reported, and managed. A comprehensive consideration of the risk analysis appears to be a necessity. The analysis results of different risk types should be comparable to each other to facilitate decision-making. Reporting and monitoring that follow through the risk management process are the main elements of the risk process measuring the system's effectiveness. Therefore, it is thought that the authors who wish to conduct research studies in this field should concentrate on the trend topics that emerged as a result of the research and carry out tasks to improve these topics would be beneficial for market actors in enhancing the citation and country collaborations. Besides, it is thought that the findings obtained in the study would contribute to determining the relevant keywords, journals, and reference sources for banking risk management studies to be conducted in the future.

Regarding the limitations of the research, the study is conducted based on the field of banking risk management. The data are limited to a specific period and obtained from the Web of Science database, a large-scale database used by the entire scientific world. Moreover, some of the bibliometric data obtained from the Web of Science for social network analysis are considered suitable for the comment. The data cleansing phase requires utmost attention, and time can be considered an overall limitation of these and similar studies.

Since the keywords in the studies consist of general expressions specific to the field, it may be suggested to the researchers who would review the literature in the field to benefit from both general and field-specific expressions. Furthermore, it may be recommended to examine field-specific and interdisciplinary journals due to the different fields of leading journals. In future studies, utilising bibliometric data obtained from other databases, it may be suggested to conduct a survey that includes the comparison of analysis results.

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