

Research Trends in Corporate Financial Distress Prediction: A Bibliometric Study

^{1*}Gengatharan Ramesh, ²Al-Mughairi Habiba, ³Madbouly Araby

^{1*, 2}Department of Business Studies, University of Technology and Applied Sciences – Ibra, Sultanate of Oman.

³Business and Accounting Department, Muscat College, Sultanate of Oman.

^{1*}drrameshg@gmail.com, ²habiba.almughairi@utas.edu.om, ³araby@muscattcollege.edu.om

Abstract

This research paper presents a bibliometric analysis of recent research papers in prediction of corporate financial distress. Research in this area has become a crucial in the present uncertain global economic environment. The study aims to explore the trends, patterns, and key contributors in academic research on corporate financial distress prediction. This research employs a systematic approach in sourcing data from the Scopus database that spans the period of 2013-2022. Several bibliometric studies were performed such as the number of published articles' yearly growth, the study citation index, co-authors' networks and keyword frequencies. The findings showed an exceptional annual increase in the scientific papers published within the specific domain of interest. Also, this particular result notes the most prominent journals, authors and citations ranked the countries. Chinese authors leading in publication output in this research field. Research collaborations between China and the UK, underscored the global nature of research in this domain. The study also tracked the evolution of research themes, emphasising persistent focuses on 'financial distress,' 'bankruptcy,' and 'financial ratios.' For researchers, the identified top journals and keywords provide crucial insights for staying current and contributing to the academic discourse. The most frequent keywords may be helpful to practitioners in tailoring their tactics in line with the industry practice. The results may also be useful to policy makers to develop international linkages and institutional frameworks pertaining to corporate financial distress prediction. This study adds to the already existed literature because it systematically analyses recent research papers taken from available evidence based on bibliometric methods in corporate financial distress prediction. The identified trends, influential contributors, and evolving research themes provide a valuable resource for researchers, practitioners, and policymakers alike. The study's originality lies in its nuanced exploration of international collaborations, evolving themes, and key contributors, offering a holistic view of the recent research in the field of corporate financial distress prediction.

Keywords: Bibliometric Study, Corporate Financial Distress, Bankruptcy Prediction, Firm Financial Distress, Citation Analysis.

1. Introduction

Due to the difficulties of challenging economic conditions and market uncertainties resulting from the global economic crisis, corporate financial distress prediction has become a crucial research area in recent years (Putri & Dhini, 2019; Qian et al., 2022). There is great concern however with the prediction of financial distress particularly to the investors, managers and regulators (Ogachi et al., 2020; Svabova et al., 2020; Yazdanfar & Öhman, 2020). There is empirical evidence that points towards the very fact that predicting financial distress in its early stages can enable stakeholders to warn and manage risk posed to a distressed entity (Altman, 1968; Kliestikova et al., 2017; Ohlson, 1980; Shahid et al., 2019).

Predicting bankruptcy has been advanced greatly by Altman (1968) and Ohlson (1980). One of the most notable models created by Altman, who is a practitioner of Z-score, focuses on multivariate discriminant analysis which has been a key feature of corporate financial distress prediction. Ohlson, on the other hand, proposed the logistic regression model, which is known as O-score which uses both financial and non-financial factors for predicting financial distress. Their works are considered the foundation for predicting corporate financial distress.

Over a period of time, several distress prediction models have evolved. They significantly improved the accuracy and reliability of corporate distress prediction (Putka et al., 2018; Ratajczak et al., 2022; Tonidandel et al., 2018; Zizi et al., 2021). Advanced data analytics, machine learning, and AI techniques, enhance corporate failure prediction capabilities (Lee & Min, 2005; Olson et al., 2012; Ravi Kumar & Ravi, 2007; Shin & Lee, 2002). Moreover, these prediction models have incorporated both non-financial and financial indicators. Recent years have witnessed a surge in the application of novel AI models and further improved distress prediction accuracy (Chou, 2019; Chuang, 2013; Durica et al., 2019; Jiang & Jones, 2018; Wang & Yan, 2015).

Previous studies have thoroughly examined the evolution of models for predicting corporate financial distress and the integration of advanced techniques. This study aims to conduct a systematic bibliometric analysis to identify recent advancements and trends in predicting corporate financial distress. This helps in identifying key authors, top-cited journals, emerging keywords, collaborative networks, etc. Such analysis provides a valuable insight into the present state of research (Li et al., 2023; Veganzones & Severin, 2021). Analysing the changing environment of predicting financial distress in corporations using bibliometric analysis will offer useful insights for academics, practitioners, and policymakers.

The structure of this paper is as follows: the next section presents a comprehensive literature review on predicting corporate financial distress, covering previous research and key findings in this field. The third section discusses the methodology while the fourth section presents the results and discussions. The fifth section highlights the implications and limitations of the study. Final section provides the conclusions, main findings and suggests areas for future research.

2. Review of literature

Published scientific research papers on predicting firm distress or bankruptcy by incorporating bibliographical studies and systematic literature are highlighted below.

Bibliometric studies are considered a crucial tool for understanding the scientific production of research papers (do Prado et al., 2016). Despite their considerable importance, a scarcity of research publications has extensively explored the methodologies of systematic literature reviews and bibliographic analyses in predicting corporate financial distress.

The work done by do Prado et al. (2016) makes an assessment of applying multivariate data approaches with respect to credit risk and bankruptcy scenarios. The survey has covered a period range between 1968 and 2014. Their findings showed that the models for bankruptcy prediction are cross-disciplinary in their formation, and there was a surge in the number of publications following the financial crisis of 2008. This observed phenomenon signifies increased attention and acknowledgement of the significance of forecasting corporate financial problems across several academic disciplines. Furthermore, the research emphasised the widespread utilisation of the neural network model in scholarly works starting in 1990. Additionally, it underscored the continued application of initial models, discriminant analysis, and logistic regression.

Shi and Li (2019) contributed to the existing perspective by systematically reviewing intelligent techniques used in bankruptcy predictions spanning five decades. The study saw a notable increase in publications after the 2008 crisis, notwithstanding the limited international collaboration among academics. The rise of artificial intelligence approaches has been indispensable as effective alternative for traditional statistical approaches. These approaches highlight their increased ability in predicting corporate financial distress.

Appiah et al. (2015) significantly contributed in developing bankruptcy prediction models on the basis of a systematic literature review. Their research primarily emphasised methodological challenges in statistical methodologies, artificial intelligence systems, and theoretical frameworks for predicting corporate bankruptcy. They reviewed 83 research articles published between 1966 and 2012, highlighting the theoretical improvements made in the development of models. Nevertheless, they emphasised the persistent challenge of developing a highly accurate, simple, and practical model.

In their study, Kovacova et al. (2019) undertook a systematic literature review of the existing literature, specifically concentrating on the nations comprising the Visegrad Four. The study aimed to ascertain the country-specific explanatory factors employed in the prediction models. The study has substantiated the existence of varying preferences among nations about explanatory variables, enhancing our understanding of predicting corporate financial distress models.

A study by Alaka et al. (2018) used systematic review on bankruptcy prediction models concentrating on the tools and techniques. They reviewed 49 journal articles that were published in the years 2010 to 2015. They highlighted the application of two statistical models and six AI tools in corporate financial distress prediction research. They emphasised that there is no single tool ideal in identifying corporate failure.

The authors of this study Mallinguh and Zéman (2020) reviewed paper from the year 2005 to 2017 considering a total of 72 papers. The observations made by researchers pointed to a significant interest in studies that took place in developed economies especially in Asian countries under developing markets scenario. The authors have concerns on the domination of quantitative research, underlined the need to use mixed methods approach.

This work is supported by systematic literature involving long-term bankruptcy prediction, as shown in Ratajczak et al. (2022). In their study, they chose 39 articles from Scopus database of articles published between 2011 and 2020. Much emphasis was laid that the big data has a crucial role in the prediction of financial distress. A variety of statistical techniques and artificial intelligence technologies were employed to improve the accuracy of financial distress predictions. They indicated that researchers have used both quantitative and qualitative methods to enhance failure prediction.

The above-mentioned reviews mainly used a systematic literature review approach and highlighted significant findings.

Firstly, there has been a significant increase in articles devoted to the topic of corporate distress early-warning models within the last decade, including pre-and post-2008 crisis articles. Secondly, the researchers employ the statistics and artificial intelligence, accounting ratios in addition. But they also stressed that there is no perfect model to indicate that a firm is on the verge of financial distress. Additionally, the literature review has emphasized the importance

of considering country-specific variables. However, this study is solely focused on the bibliographical mapping of recent research papers. This type of investigation allows the readers to trace the sources and evaluate the reliability of the information presented in this field. This stresses the importance of bibliographical mapping as a way of generating useful knowledge on this constantly evolving field of study.

3. Methodology

This study applies a systematic approach in order to identify relevant research. This helps to get more accurate information of intellectual history in a systematic way (Farooq et al., 2018). Thus, systematic bibliometric analysis provides scope for more objective and reliable study (Aria & Cuccurullo, 2017), methodological transparency, and allows for future replication. Since this study focuses on analysing the recent intellectual developments in predicting corporate financial distress, the articles published during the past 10 years, i.e., 2013-2022, from the Scopus database were considered a dataset.

Scopus is a reliable and comprehensive database with extensive coverage of research articles in multiple fields (Abrizah et al., 2013; López-Illescas et al., 2008; Moed et al., 2016; Powell & Peterson, 2017). It covers more fields in humanities, social sciences, arts and sciences, business management and economics (Mingers & Lipitakis, 2010; Mongeon & Paul-Hus, 2016). In addition, it includes a variety of regional topics, which makes it possible for scholars to read publications from various corners of the world.

3.1 Search strategy

The search strings identified through previous research in this field (Pan, 2012; Serrano-Silva et al., 2018; Tserng et al., 2014) were applied for identifying relevant research papers from the Scopus database. Inclusion of the final search terms in the search criteria was arrived at after some trial searches. Yet some terms (for example, predict, default, and model) did not help to get more related documents. Hence, they were omitted from the search string. The actual search string used for the present study is ((*"distress"* OR *"failure"* OR *"bankruptcy"* OR *"insolvency"*) AND (*"firm"* OR *"corporate"* OR *"company"* OR *"business"* OR *"financial"*)). The search was limited to the titles of the journal articles published in English from 2013 to 2022. This area of research is interdisciplinary nature. Therefore, the authors applied filters to include subject areas such as “business, management, and accounting,” “social sciences,” “economics, econometrics, and finance,” “decision sciences,” and “multidisciplinary.” This search was performed on February 3, 2023, and identified 1,365 documents. Figure 1, the PRISMA flowchart, explains the systematic procedure for identifying the documents. Prior to title screening, the authors removed three duplicate documents and a non-English research paper, which resulted in considering 1361 data sets for screening.

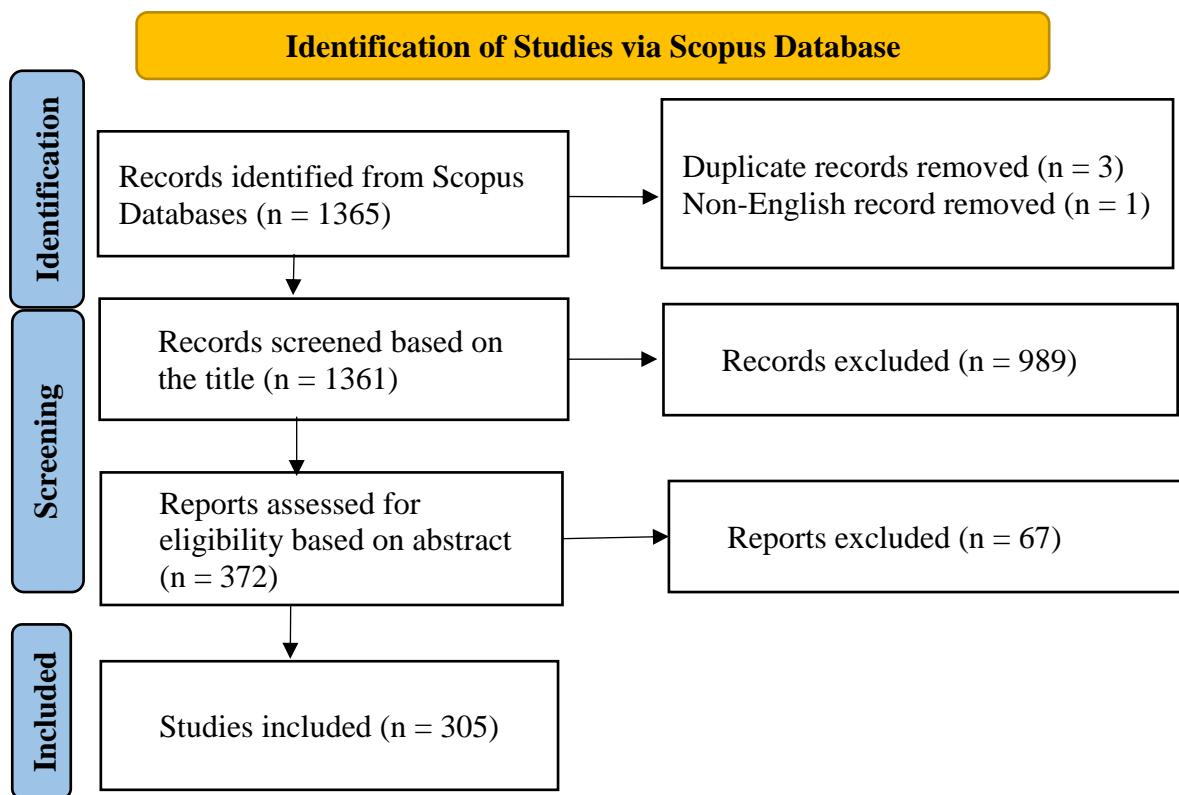


Figure 1. Flowchart of the document identification

3.2 Inclusion and Exclusion During the Screening Process

The purpose of this research is to conduct a bibliometric analysis to predict corporate financial distress. Therefore, at the beginning of the screening process for research articles, the researchers manually checked the identified documents' titles for inclusion in our study. The irrelevant research papers were excluded for this study based on specific criteria: (1) financial distress of the small firms, specific kind of businesses for instance airline, oil industry, agricultural industry, hospitality firm, government sector, and cases; (2) macroeconomic factors, COVID effects, and innovation failure; and (3) insolvency law, the legal framework and a risk of bankruptcy litigation. When screening articles in this process, 989 documents were removed.

3.3 Final Screening

Subsequently, after a detailed screening, 372 articles were brought to the final screening. The abstracts of these papers were reviewed by the researchers using the above-mentioned criteria. At the final screening, 67 datasets were found to be not relevant to the study.

3.4 Data analysis

Accordingly, the final list of datasets selected for the bibliometric analysis includes 305 articles related to the subject of corporate financial distress prediction. R-Studio was used to perform the bibliometric study. It is an open-source software and the most popular scientific programming language. It offers an extensive and effective statistical algorithm. Thus, it provides easy access to high-quality numeric and integrated visualizers for data analysis (Aria & Cuccurullo, 2017). To perform the bibliometric analyses in R-Studio, the 'biblioshiny'

library package was used. This tool assists in studying the development of published papers, citation, collaboration, bibliographic linkage and keyword frequencies in scientific journals (Chaerani et al., 2023).

4. Results

In this section, bibliometric analysis of the trends in the corporate financial distress prediction is presented. The analysis includes exploring the trends of the number of publications, citations, co-authors, bibliographic coupling, and keyword frequencies in scientific publications.

4.1 Descriptive Statistics

Figure 2 depicts the trend of the annual growth of the publications on predicting corporate financial distress. In the study period the productivity of scientific research papers scientific research papers showed rapid growth. The publication shows an increasing trend in most years except 2016 and 2020. Figure 3 shows the average number of citations received per year. It shows that the highest average number of citations per year was in 2017, with 4.3 citations. After that, the average citation per year decreased. The decrease in average citations could be due to the publication of many research papers after 2017 and the availability of fewer citable years for those documents. The main information about the dataset is presented in Table 4. The annual growth rate of scientific publications in corporate financial distress prediction is 12.98%. The average citation is 14.45, and co-authorship is 2.73 per document. Furthermore, 25.25% of the publications had international co-authorship collaborations. It shows that there is a growing academic interest among researchers in the subject matter of corporate financial distress prediction. Thus, it appears that there is increasing awareness of the need for financial distress prediction. Also, the consequences of financial distress can have significant implications to the investors, other stakeholders and even financial institutions.

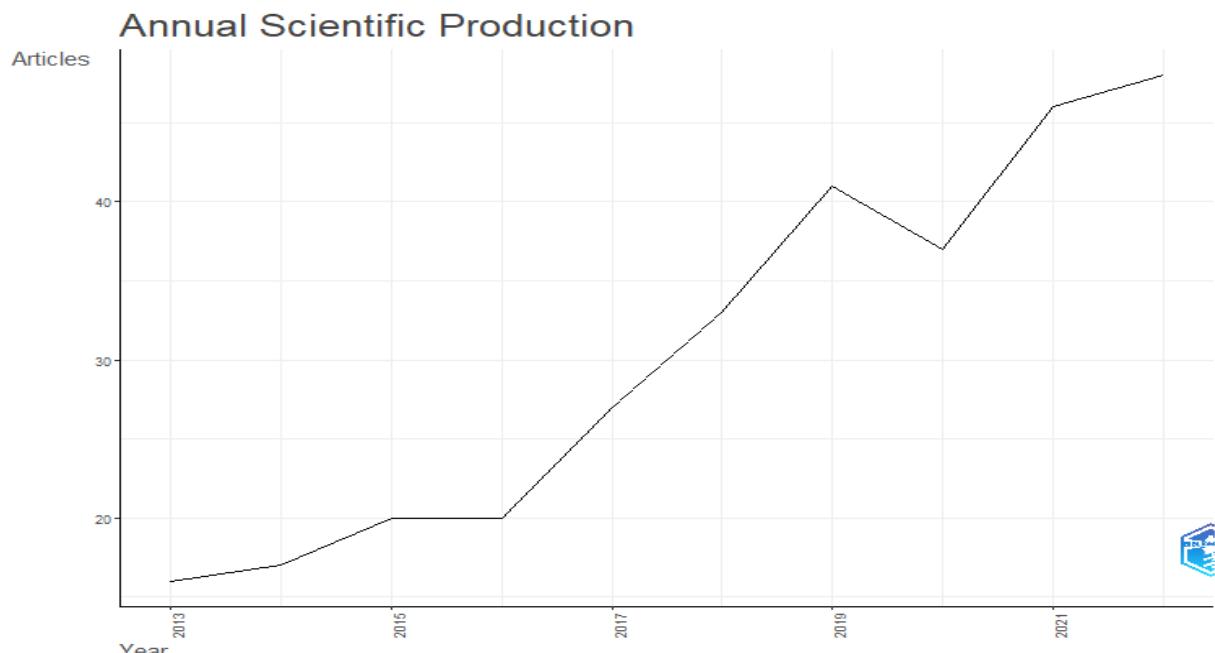


Figure 2. The publication output performance

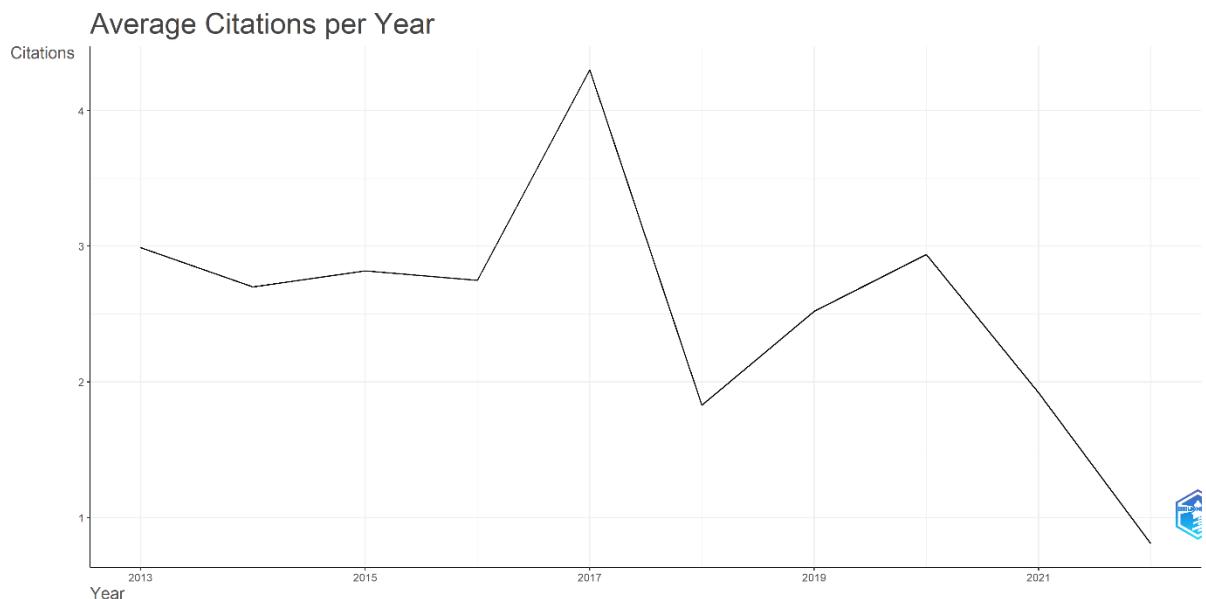


Figure 3. The publication output performance

Table 1. Main information about the data

Description	Results
Timespan	2013-2022
Sources (Journals, Books, etc.)	184
Documents	305
Annual Growth Rate %	12.98
Document Average Age	4.44
Average citations per doc	14.45
References	14871
DOCUMENT CONTENTS	
Keywords Plus (ID)	342
Author's Keywords (DE)	828
AUTHORS	
Authors	709
Authors of single-authored docs	40
AUTHORS COLLABORATION	
Single-authored docs	45
Co-Authors per Doc	2.73
International Co-authorships %	25.25
DOCUMENT TYPES	
Article	305

The three-field plot is demonstrated in Figure 4, showing the top 10 cited journal sources for corporate financial distress prediction. The top 10 keywords are financial distress, bankruptcy, bankruptcy prediction, corporate governance, financial ratios, logistic regression, financial distress prediction, z-score, machine learning, and business failure. The Journal of Expert Systems with Applications (citation score 588), the Journal of Accounting Research (citation

score 530), and the Journal of Financial Economics (citation score 445) were the three major sources of the citations. Figure 4 displays the top 10 first-author's countries. Chinese authors publish more research papers than those from the USA. The publication by authors from Spain holds the third position. The breadth of the link in the diagram reveals its strength. For example, the authors from China contributed more to the journal 'Expert Systems with Applications' and mainly used the keyword 'financial distress prediction.' On the other hand, authors from the USA mainly contributed to the 'Journal of Finance,' and they used 'financial distress' as the essential keyword.

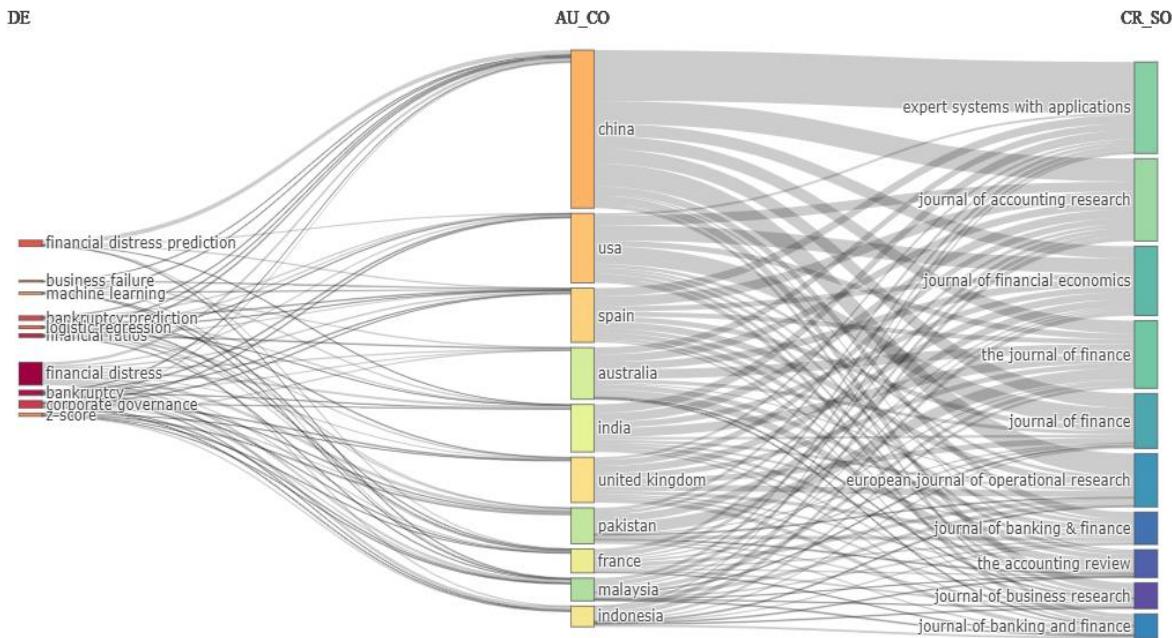


Figure 4. Three-Field Plot: Top 10 keywords (DE), author country (AU_CO), and cited sources (CR_SO)

4.2. Analysis of Journal and Author Information

In figures 5a-d, journals and author information of the articles included in the study period are given. As presented in Figure 5a, the top ten journals that have focused on predicting corporate financial distress are Journal of Forecasting, Computational Economics, Corporate Governance (Bingley), Knowledge-Based Systems, Managerial Finance, Advanced Science Letters, Cogent Business and Management, International Journal of Law and Management, Investment Management and Financial Innovations, and the Academy of Accounting and Financial Studies Journal.

Figure 5b shows the 10 most highly cited journals in the articles used for this study. The Journal of Accounting Research received the highest number of citations, followed by Expert Systems with Applications. Figure 5c shows the top 10 active authors who have published research articles on corporate financial distress prediction. Wu, C. has contributed seven research papers among the authors, while Liu, J., and Sun, J., have contributed six articles. Jones, S., Laitinen, E.K., and Li, H. each published five articles; Lukason, O., and Suvas, A. each produced four; Charalambakis, E.C., and Durica, M. each produced three articles during the study period. Figure 5d displays the top 10 authors with the most local citations. In the study, Severin, E., and Veganzones, D. were the most cited authors, with 30 citations each, followed by Bredart,

X., with 29 citations. Bal, J., Cheung, Y., and Wu, H.G. received 24 citations, while Durica, M., Frnda, J., and Svabova, L. were cited 22 times each. Laitinen, E.K., was cited 21 times in the research papers analysed.

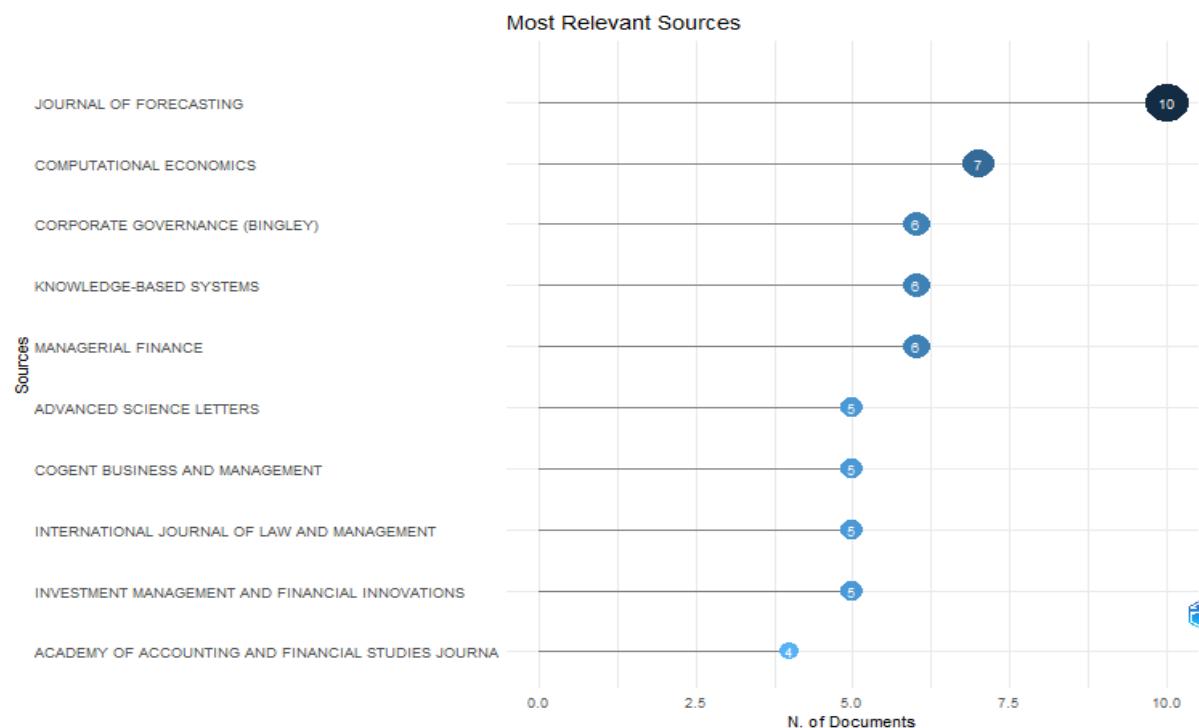


Figure 5a. Most relevant journal sources for publishing

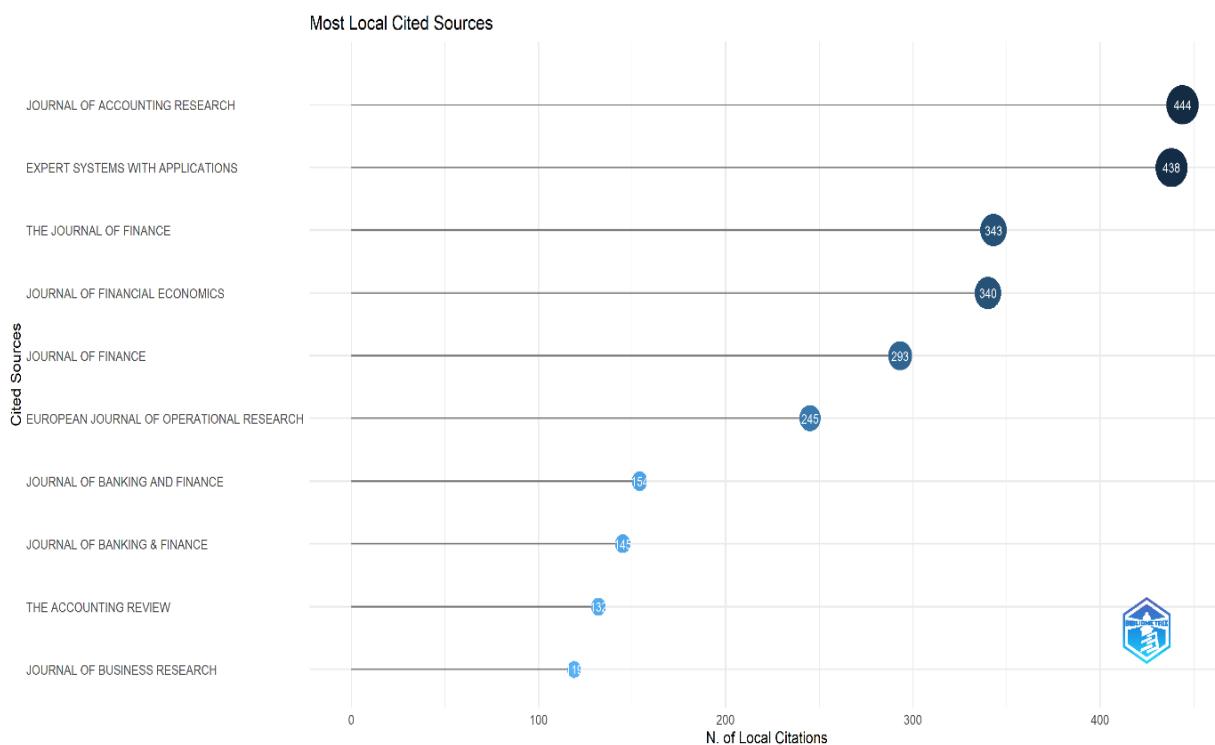


Figure 5b. Most locally cited journal sources

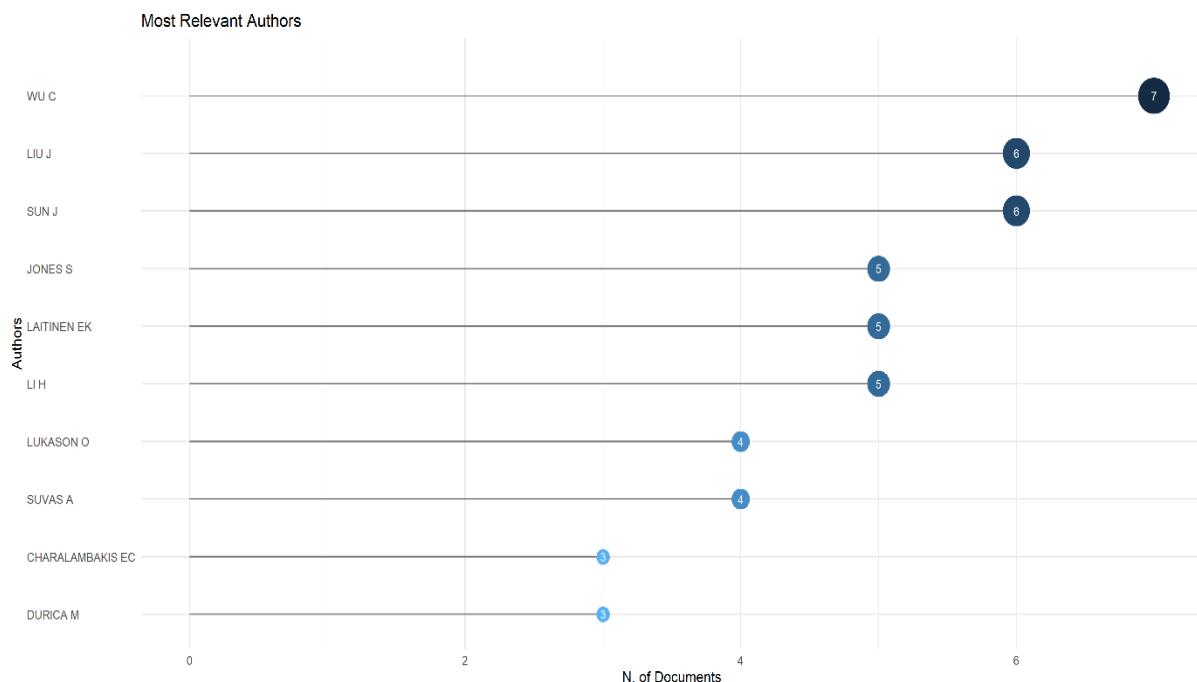


Figure 5c. Most relevant authors

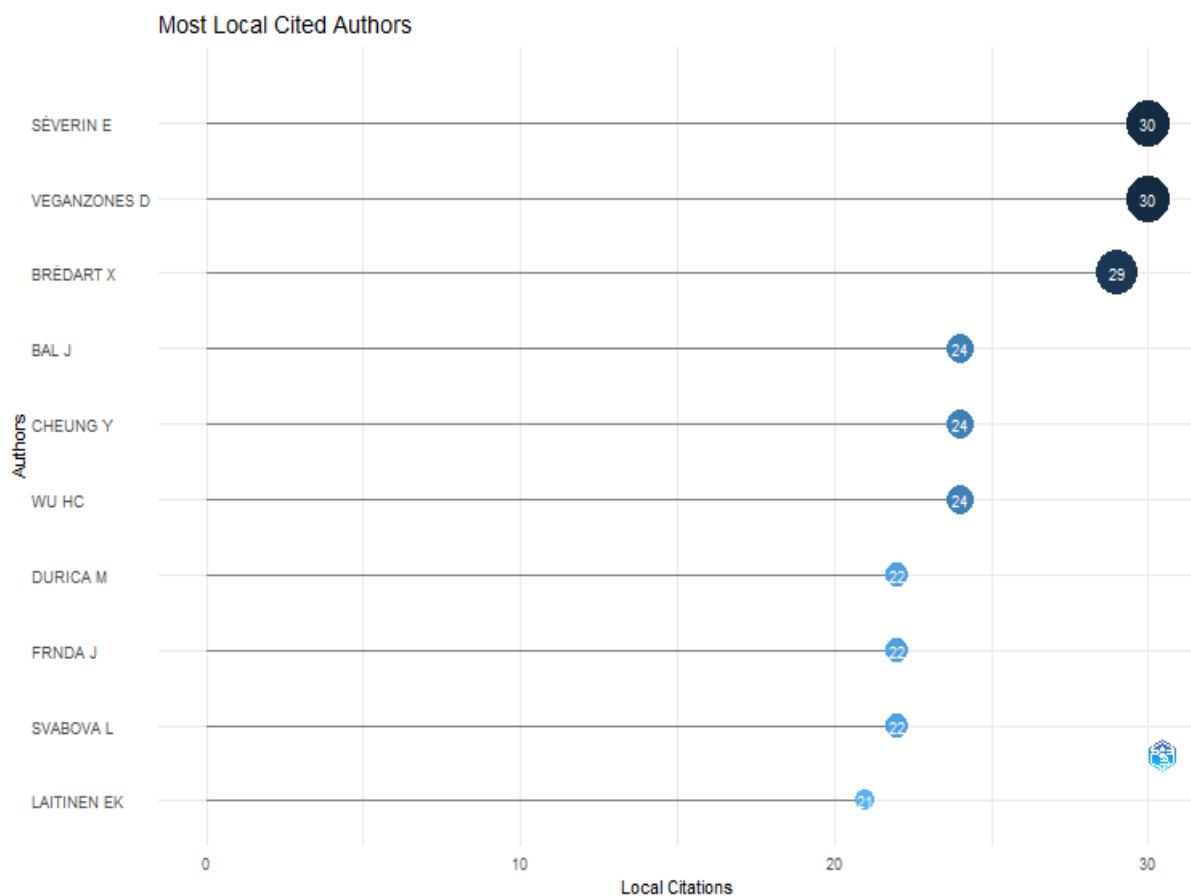


Figure 5d. Most local cited authors

4.3 Analysis of Region/Country Contribution and Collaboration

Analyzing research collaborations is also relevant since it means the creation of informational and knowledge exchange, and, hence, innovation and creativity in the field of predicting corporate financial distress. Research collaborations ensure that researchers from different fields with different backgrounds. This may provide robust and comprehensive research findings. The top ten regions that have contributed the most articles on predicting corporate financial distress are presented in Table 2. China is the most productive country in the field of corporate financial distress prediction with 31.15% contributions in terms of published documents during the study period. Among the developed countries, the USA's contribution constitutes 14.75%, Spain's 10.82%, the UK's 10.16%, France's 8.85%, and Australia's 8.2%. Other developing countries like Indonesia (9.18%), India (8.85%), Pakistan (8.2%), and Malaysia (7.87%) also significantly contributed to the research on corporate financial distress prediction. The table also shows that the Chinese publications received 1016 citations, while the citation score for USA-published articles was 366. The UK's document citation was 255, whereas the documents originating from Spain, France, and Australia were cited around 200 times.

Table 2. Top 10 Countries by Research Output and Citations

Country	No. of documents	% to total documents	No. of citations
CHINA	95	31.15	1016
USA	45	14.75	366
SPAIN	33	10.82	197
UK	31	10.16	255
INDONESIA	28	9.18	29
FRANCE	27	8.85	194
INDIA	27	8.85	76
AUSTRALIA	25	8.20	198
PAKISTAN	25	8.20	120
MALAYSIA	24	7.87	50

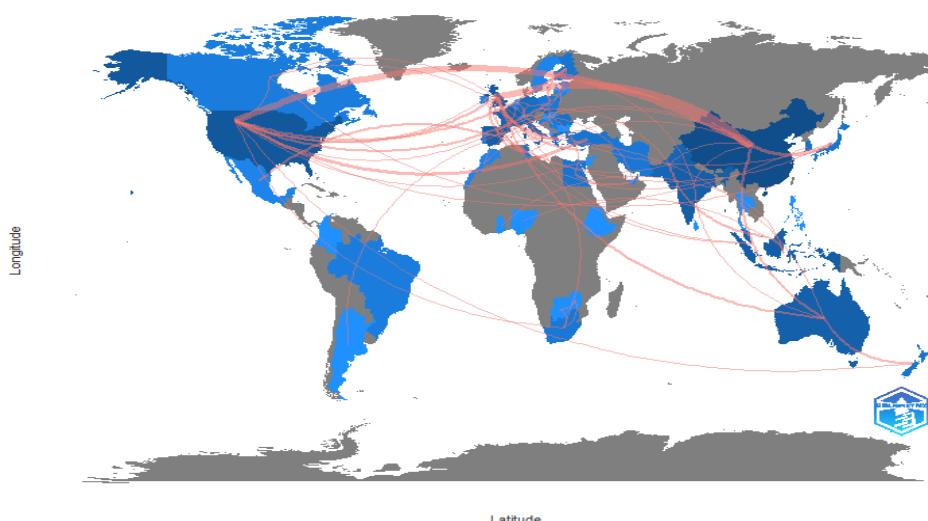


Figure 6. Country-wise collaborations on research

Figure 6 displays the graphical linkage of research collaborations between different countries. Top 10 country-wise collaborations in the research related to the prediction of corporate financial distress are presented in the Table 3. The most collaborated countries were China and the UK; they have published nine articles on the field of predicting corporate financial distress from 2013 to 2022. The second major cooperation was identified between China and the USA where seven articles were published. Three and two publications of the Chinese researchers are in collaboration with Japan and Australia respectively.

Table 3. Top 10 country-wise collaborations

From	To	Frequency
CHINA	UNITED KINGDOM	9
CHINA	USA	7
CHINA	JAPAN	3
UNITED KINGDOM	GREECE	3
USA	TURKEY	3
AUSTRALIA	NEW ZEALAND	2
CHINA	AUSTRALIA	2
EGYPT	UNITED ARAB EMIRATES	2
FINLAND	POLAND	2
FRANCE	TUNISIA	2

4.4 Analysis and Co-occurrence Network of Keywords

Authors' keywords can represent an article's main content. The frequency of occurrence and co-occurrence of those keywords can show the themes focusing on a specific subject matter (Chen et al., 2016). Examining the frequency with which keywords are used in academic literature can identify potential areas of collaboration. Creating a co-occurrence network can also help to visualise the connections between different keywords. It can provide a valuable tool for identifying key themes and clusters within a particular research area.

Figure 7a presents the top 10 author's keywords. The top keyword was financial distress. It occurred 119 times in the scientific documents retrieved from the Scopus database between 2013 and 2022. The second frequently used author's keyword is bankruptcy, with 47 occurrences, followed by financial ratios (30 occurrences) and corporate governance (29 occurrences) as the third and fourth occurring author's keywords, respectively. Other top keywords are bankruptcy prediction (25 occurrences), financial distress prediction (23 occurrences), logistic regression (18 occurrences), business failure (12 occurrences), z-score (12 occurrences), and machine learning (11 occurrences).

Figure 7b presents the author's most frequently used 50 keywords as a word cloud. The word cloud is a visual image of the words that has occurred most frequently in the research papers and its size determines the frequency or perceived importance of the word. When generating a word cloud from the set of author-chosen keywords, the researchers can immediately detect the most frequently used words and topics in a given set of documents (Song et al., 2019). Financial distress, bankruptcy, and financial ratio are the three most frequently used keywords, according to the word-cloud analysis.

Figure 7c highlights the evolution of corporate financial distress prediction research themes across three different time points in the study period (i.e., 2013 to 2016, 2017 to 2019, and 2020 to 2022). In all the time points, the corporate financial distress prediction research focused on the themes of ‘financial distress’ and ‘bankruptcy’. Similarly, business failure, firm failure, and failure prediction are not evolving. The current research on corporate financial distress prediction mainly focuses on the themes of financial distress prediction, bankruptcy, corporate financial distress, and financial distress.

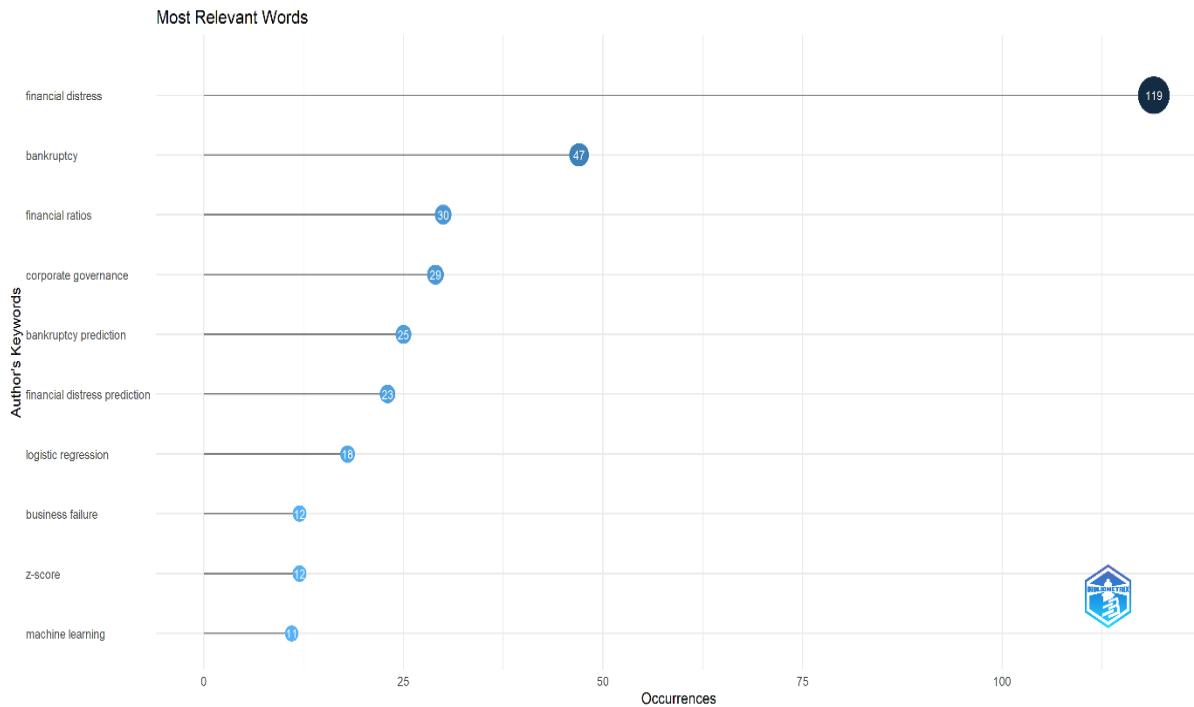


Figure 7a. Top 10 author's keywords



Figure 7b. Word cloud of the author's keywords

The author's keyword co-occurrence network presented in Figure 7d gives an insight into the trends in the research on corporate financial distress prediction. It illustrates the relationships between the keywords in the literature in which the thickness of the line denotes the degree of relation. Analysis of network diagram shows that the mapped keyword ‘financial distress’ is

driving more significance and has stronger tie with the keyword's 'bankruptcy' and 'corporate governance'. Likewise, 'financial ratio' keyword has a strong link with 'business failure', 'logit' and 'prediction models. The keyword 'bankruptcy prediction' is closely related to 'financial distress prediction' and 'logistic regression', among other keywords.

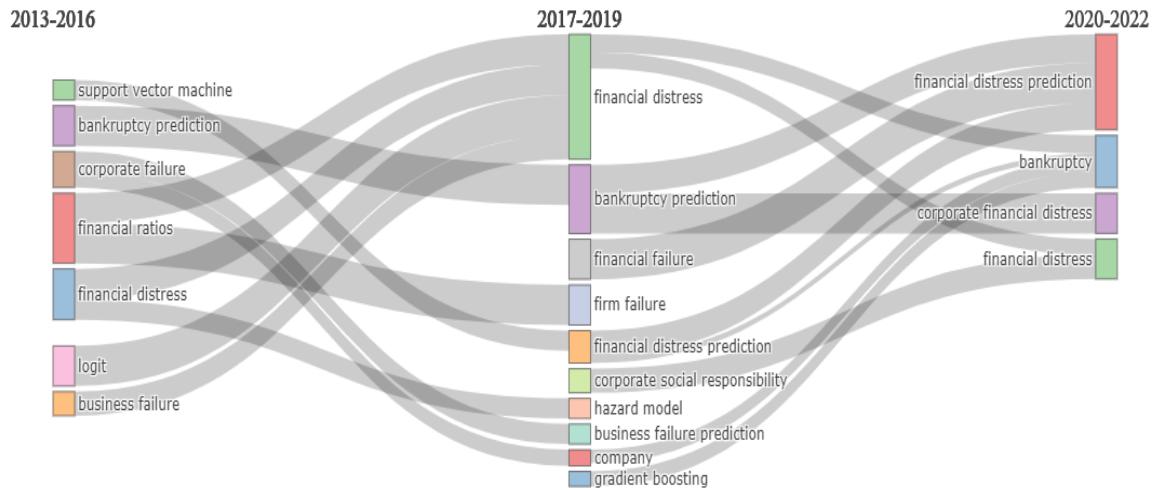


Figure 7c. Thematic evolution of research

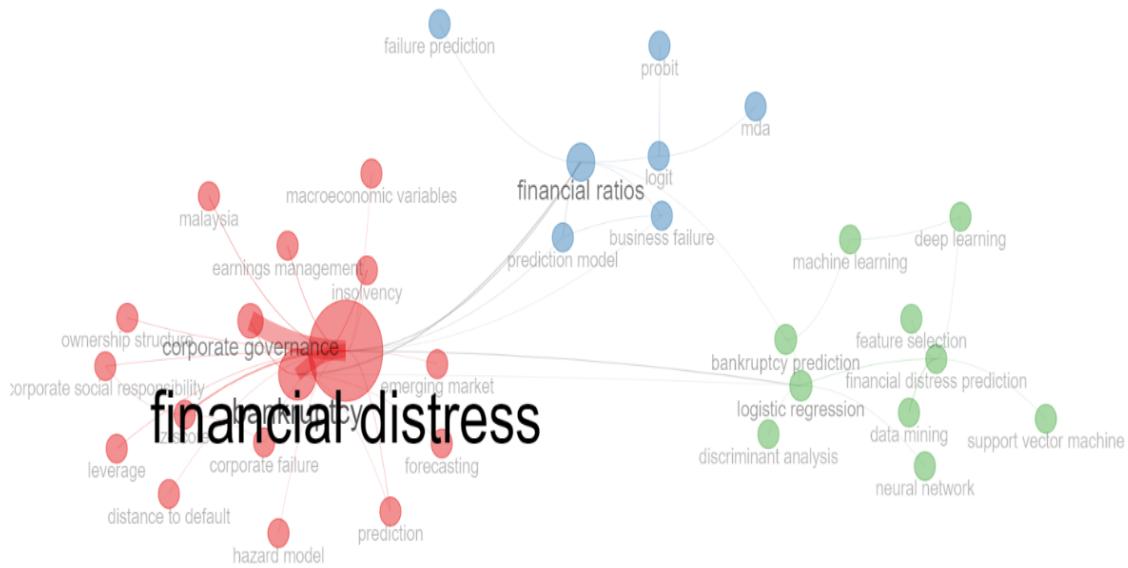


Figure 7d. The author's keyword co-occurrence network

5. Implications and Limitations of the Study

While the themes of financial distress and bankruptcy have consistently been the focus of research in this field, it is noteworthy that there is a growing interest in topics such as machine learning and corporate governance. This suggests that researchers are exploring new approaches and factors that can improve the prediction of financial distress in companies.

Understanding these emerging themes can guide future research and inform decision-making in the corporate sector. The implications of this study extend to various stakeholders, including researchers, practitioners, and policymakers. Researchers can utilise the prominent publications, such as the Journal of Expert Systems with Applications, the Journal of Accounting Research, and the Journal of Financial Economics, by regularly reading and analysing the articles published in these journals. By doing so, researchers can stay informed about the latest methodologies, models, and datasets used in corporate financial distress prediction. They can also identify key researchers and thought leaders in the field and follow their work closely. Additionally, researchers can use these publications to identify gaps in the current literature and areas for further research. Practitioners in the field can benefit from understanding the most frequently used author's keywords, such as 'financial distress,' 'bankruptcy,' and 'financial ratios,' in several ways. Firstly, by staying informed about these keywords, practitioners can ensure that they are using the most relevant and up-to-date terminology in their work. This helps them effectively communicate with colleagues and clients and stay aligned with current industry trends. Secondly, understanding these keywords allows practitioners to search for and access relevant research articles and reports more efficiently. This saves time and helps them stay informed about the latest developments in corporate financial distress prediction. Policymakers can utilise the findings on international collaborations by analysing the successful collaboration between China and the UK as an example. By studying the factors that have contributed to the success of this collaboration, policymakers can identify strategies and best practices that can be applied to foster international research relationships in their own countries. Additionally, by analysing the growth of study topics over time, policymakers can gain a detailed comprehension of the specific areas that are being emphasised in predicting financial distress. This knowledge can guide regulatory decisions and the formulation of policies that address the emerging challenges and trends in the field.

This research's limitations should also be considered when using its results. First, datasets are systematically selected from the Scopus database based on inclusion criteria such as search keywords, manuscript language, year of publication, document type, and field of publication. Hence, those inclusion criteria would have restricted some potential manuscripts from being included in this study. Secondly, although the authors took great care in identifying relevant research papers, some were inadvertently excluded. Nevertheless, the datasets used are sufficient to mirror the literature in the study field. Finally, the datasets were processed using R-Studio. However, any inherent limitations of this analytical tool on the study's outcome cannot be eliminated. Additionally, the study period may not capture the most recent developments in the field. These limitations should be considered when interpreting the findings.

6. Conclusions

This research paper mainly aims to provide bibliometric information about predicting corporate financial distress. The systematic approach to identifying the datasets ensures that the information obtained is reliable, objective, and transparent. The Scopus database was used to obtain the dataset, and the bibliometric analysis was conducted using R Studio with the 'biblioshiny' library package. A total of 305 journal articles were selected for the study from 2013 to 2022. The bibliometric tool helped to examine the evolution of published papers, citation analysis, co-authorship, bibliographic coupling, and keyword occurrence in scientific publications. This study reveals a notable annual growth in research productivity, with a 12.98%

annual growth rate in scientific publications. Despite a peak in average citations per year in 2017, there is a subsequent decline, potentially attributed to an increase in research papers post-2017, impacting the average citation per document. China emerges as the leading contributor to this research field, with the USA and the UK also making substantial contributions. The collaborative landscape shows strong partnerships between China and the UK, as well as China and the USA, indicating global cooperation in advancing knowledge on corporate financial distress prediction. The analysis of author keywords demonstrates a consistent focus on themes like 'financial distress,' 'bankruptcy,' and 'financial ratios' throughout the study period, while the co-occurrence network highlights the interconnectedness of these keywords, emphasising their significant impact on the overall research landscape.

Future research in corporate financial distress prediction could delve into refining predictive models, exploring emerging technologies, and addressing the gaps identified in this bibliometric analysis. Additionally, a deeper investigation into the impact of external factors, such as economic crises or technological advancements, on financial distress prediction models could provide further valuable insights. The evolving landscape of big data and artificial intelligence warrants continuous exploration to stay at the forefront of predictive analytics in corporate finance.

References

1. Abrizah, A., Zainab, A. N., Kiran, K., & Raj, R. G. (2013). LIS journals scientific impact and subject categorization: A comparison between Web of Science and Scopus. *Scientometrics*, 94(2), 721–740. <https://doi.org/10.1007/s11192-012-0813-7>
2. Alaka, H. A., Oyedele, L. O., Owolabi, H. A., Kumar, V., Ajayi, S. O., Akinade, O. O., & Bilal, M. (2018). Systematic review of bankruptcy prediction models: Towards a framework for tool selection. *Expert Systems with Applications*, 94, 164–184. <https://doi.org/10.1016/j.eswa.2017.10.040>
3. Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, 23(4), 589–609. <https://doi.org/10.1111/j.1540-6261.1968.tb00843.x>
4. Appiah, K. O., Chizema, A., & Arthur, J. (2015). Predicting corporate failure: a systematic literature review of methodological issues. *International Journal of Law and Management*, 57(5), 461–485. <https://doi.org/10.1108/IJLMA-04-2014-0032>
5. Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of Informetrics*, 11(4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>
6. Chaerani, D., Shuib, A., Perdana, T., & Irmansyah, A. Z. (2023). Systematic Literature Review on Robust Optimization in Solving Sustainable Development Goals (SDGs) Problems during the COVID-19 Pandemic. *Sustainability*, 15(7), 5654. <https://doi.org/10.3390/su15075654>
7. Chen, X., Chen, J., Wu, D., Xie, Y., & Li, J. (2016). Mapping the Research Trends by Co-word Analysis Based on Keywords from Funded Project. *Procedia Computer Science*, 91, 547–555. <https://doi.org/10.1016/j.procs.2016.07.140>
8. Chou, T. N. (2019). An Explainable Hybrid Model for Bankruptcy Prediction Based on the Decision Tree and Deep Neural Network. *Proceedings of the 2nd IEEE International Conference on Knowledge Innovation and Invention 2019, ICKII 2019*, 122–125. <https://doi.org/10.1109/ICKII46306.2019.9042639>
9. Chuang, C. L. (2013). Application of hybrid case-based reasoning for enhanced

- performance in bankruptcy prediction. *Information Sciences*, 236, 174–185. <https://doi.org/10.1016/j.ins.2013.02.015>
10. do Prado, J. W., de Castro Alcântara, V., de Melo Carvalho, F., Vieira, K. C., Machado, L. K. C., & Tonelli, D. F. (2016). Multivariate analysis of credit risk and bankruptcy research data: a bibliometric study involving different knowledge fields (1968–2014). *Scientometrics*, 106(3), 1007–1029. <https://doi.org/10.1007/s11192-015-1829-6>
 11. Durica, M., Valaskova, K., & Janoskova, K. (2019). Logit business failure prediction in V4 countries. *Engineering Management in Production and Services*, 11(4), 54–64. <https://doi.org/10.2478/emj-2019-0033>
 12. Farooq, U., Jibran Qamar, M. A., & Haque, A. (2018). A three-stage dynamic model of financial distress. *Managerial Finance*, 44(9), 1101–1116. <https://doi.org/10.1108/MF-07-2017-0244>
 13. Jiang, Y., & Jones, S. (2018). Corporate distress prediction in China: a machine learning approach. *Accounting and Finance*, 58(4), 1063–1109. <https://doi.org/10.1111/acfi.12432>
 14. Kliestikova, J., Misankova, M., & Kliestik, T. (2017). Bankruptcy in Slovakia: International comparison of the creditor's position. *Oeconomia Copernicana*, 8(2), 221–237. <https://doi.org/10.24136/oc.v8i2.14>
 15. Kovacova, M., Kliestik, T., Valaskova, K., Durana, P., & Juhaszova, Z. (2019). Systematic review of variables applied in bankruptcy prediction models of Visegrad group countries. *Oeconomia Copernicana*, 10(4), 743–772. <https://doi.org/10.24136/oc.2019.034>
 16. Lee, Y. C., & Min, J. H. (2005). Bankruptcy prediction using support vector machine with optimal choice of kernel function parameters. *Expert Systems with Applications*, 28(4), 603–614.
 17. Li, S., Wu, Y., & Chen, Y. (2023). A systematic and bibliometric review of the latest techniques in quantum-dot computers. *Optik*, 283. <https://doi.org/10.1016/j.ijleo.2023.170893>
 18. López-Illescas, C., de Moya-Anegón, F., & Moed, H. F. (2008). Coverage and citation impact of oncological journals in the Web of Science and Scopus. *Journal of Informetrics*, 2(4), 304–316. <https://doi.org/10.1016/j.joi.2008.08.001>
 19. Mallinguh, E. B., & Zéman, Z. (2020). Financial distress, prediction, and strategies by firms: A systematic review of literature. *Periodica Polytechnica Social and Management Sciences*, 28(2), 162–176. <https://doi.org/10.3311/PPSO.13204>
 20. Mingers, J., & Lipitakis, E. A. E. C. G. (2010). Counting the citations: A comparison of Web of Science and Google Scholar in the field of business and management. *Scientometrics*, 85(2), 613–625. <https://doi.org/10.1007/s11192-010-0270-0>
 21. Moed, H. F., Bar-Ilan, J., & Halevi, G. (2016). A new methodology for comparing Google Scholar and Scopus. *Journal of Informetrics*, 10(2), 533–551. <https://doi.org/10.1016/j.joi.2016.04.017>
 22. Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: a comparative analysis. *Scientometrics*, 106(1), 213–228. <https://doi.org/10.1007/s11192-015-1765-5>
 23. Ogachi, D., Ndege, R., Gaturu, P., & Zoltan, Z. (2020). Corporate Bankruptcy Prediction Model, a Special Focus on Listed Companies in Kenya. *Journal of Risk and Financial Management*, 13(3), 47. <https://doi.org/10.3390/jrfm13030047>
 24. Ohlson, J. A. (1980). Financial Ratios and the Probabilistic Prediction of Bankruptcy. *Journal of Accounting Research*, 18(1), 109. <https://doi.org/10.2307/2490395>
 25. Olson, D. L., Delen, D., & Meng, Y. (2012). Comparative analysis of data mining methods for bankruptcy prediction. *Decision Support Systems*, 52(2), 464–473.

- <https://doi.org/10.1016/j.dss.2011.10.007>
- 26. Pan, W. T. (2012). A new Fruit Fly Optimization Algorithm: Taking the financial distress model as an example. *Knowledge-Based Systems*, 26, 69–74. <https://doi.org/10.1016/j.knosys.2011.07.001>
 - 27. Powell, K. R., & Peterson, S. R. (2017). Coverage and quality: A comparison of Web of Science and Scopus databases for reporting faculty nursing publication metrics. *Nursing Outlook*, 65(5), 572–578. <https://doi.org/10.1016/j.outlook.2017.03.004>
 - 28. Putka, D. J., Beatty, A. S., & Reeder, M. C. (2018). Modern Prediction Methods: New Perspectives on a Common Problem. *Organizational Research Methods*, 21(3), 689–732. <https://doi.org/10.1177/1094428117697041>
 - 29. Putri, H. R., & Dhini, A. (2019). Prediction of financial distress: Analyzing the industry performance in stock exchange market using data mining. 2019 16th International Conference on Service Systems and Service Management, ICSSSM 2019. <https://doi.org/10.1109/ICSSSM.2019.8887824>
 - 30. Qian, H., Wang, B., Yuan, M., Gao, S., & Song, Y. (2022). Financial distress prediction using a corrected feature selection measure and gradient boosted decision tree. *Expert Systems with Applications*, 190. <https://doi.org/10.1016/j.eswa.2021.116202>
 - 31. Ratajczak, P., Szutowski, D., & Szulczewska-Remi, A. (2022). Long-Term Bankruptcy Prediction. Systematic Literature Review. *SSRN Electronic Journal*, 2018. <https://doi.org/10.2139/ssrn.4054665>
 - 32. Ravi Kumar, P., & Ravi, V. (2007). Bankruptcy prediction in banks and firms via statistical and intelligent techniques - A review. *European Journal of Operational Research*, 180(1), 1–28. <https://doi.org/10.1016/j.ejor.2006.08.043>
 - 33. Serrano-Silva, Y. O., Villuendas-Rey, Y., & Yáñez-Márquez, C. (2018). Automatic feature weighting for improving financial Decision Support Systems. *Decision Support Systems*, 107, 78–87. <https://doi.org/10.1016/j.dss.2018.01.005>
 - 34. Shahid, N., Rappon, T., & Berta, W. (2019). Applications of artificial neural networks in health care organizational decision-making: A scoping review. *PLoS ONE*, 14(2). <https://doi.org/10.1371/journal.pone.0212356>
 - 35. Shi, Y., & Li, X. (2019). A bibliometric study on intelligent techniques of bankruptcy prediction for corporate firms. *Heliyon*, 5(12). <https://doi.org/10.1016/j.heliyon.2019.e02997>
 - 36. Shin, K. S., & Lee, Y. J. (2002). A genetic algorithm application in bankruptcy prediction modeling. *Expert Systems with Applications*, 23(3), 321–328. [https://doi.org/10.1016/S0957-4174\(02\)00051-9](https://doi.org/10.1016/S0957-4174(02)00051-9)
 - 37. Song, Y., Chen, X., Hao, T., Liu, Z., & Lan, Z. (2019). Exploring two decades of research on classroom dialogue by using bibliometric analysis. *Computers and Education*, 137, 12–31. <https://doi.org/10.1016/j.compedu.2019.04.002>
 - 38. Svabova, L., Michalkova, L., Durica, M., & Nica, E. (2020). Business failure prediction for Slovak small and medium-sized companies. *Sustainability (Switzerland)*, 12(11). <https://doi.org/10.3390/su12114572>
 - 39. Tonidandel, S., King, E. B., & Cortina, J. M. (2018). Big Data Methods: Leveraging Modern Data Analytic Techniques to Build Organizational Science. *Organizational Research Methods*, 21(3), 525–547. <https://doi.org/10.1177/1094428116677299>
 - 40. Tserng, H. P., Chen, P. C., Huang, W. H., Lei, M. C., & Tran, Q. H. (2014). Prediction of default probability for construction firms using the logit model. *Journal of Civil Engineering and Management*, 20(2), 247–255. <https://doi.org/10.3846/13923730.2013.801886>

41. Veganzones, D., & Severin, E. (2021). Corporate failure prediction models in the twenty-first century: a review. *European Business Review*, 33(2), 204–226. <https://doi.org/10.1108/EBR-12-2018-0209>
42. Wang, X., & Yan, L. (2015). PCA-SVM model building and application for financial distress predication of listed companies. *Journal of Information and Computational Science*, 12(3), 1249–1256. <https://doi.org/10.12733/jics20105479>
43. Yazdanfar, D., & Öhman, P. (2020). Financial distress determinants among SMEs: empirical evidence from Sweden. *Journal of Economic Studies*, 47(3), 547–560. <https://doi.org/10.1108/JES-01-2019-0030>
44. Zizi, Y., Jamali-Alaoui, A., El Goumi, B., Oudgou, M., & El Moudden, A. (2021). An optimal model of financial distress prediction: A comparative study between neural networks and logistic regression. *Risks*, 9(11). <https://doi.org/10.3390/risks9110200>