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An Elapsing of Corporate Bankruptcy and Financial Crisis with a Bibliographic Scient metric Approach

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ABSTRACT

The aim of the current study is to review the progress of bankruptcy studies and the financial fragility of companies. The research method is the bibliometric analysis of studies that investigate the characteristics of published articles such as authors, countries, topics, and frequently used keywords. The research samples are 115 articles in the field of bankruptcy indexed in the Scopus scientific database from 2013 to 2023. The reviews indicated that research in the field of corporate bankruptcy and financial crises has entered reputable databases since 1989. The United States and England have published the majority of articles on bankruptcy. Through an examination of the co-occurrence map of keywords, it was revealed that the term "financial crisis" is the most recurrent keyword in this category of articles. Additionally, following the identification of research gaps, the most cited articles in this field were introduced,the most cited article was "Financial Distress Prediction in an International Context: A Review and Empirical Analysis of Altman's Z-Score Model" Altman, in 2017.

Keywords: Bibliometric Analysis, Corporate Bankruptcy, Financial Crisis

1. Introduction

The financial situation of a company and its stability in the face of bankruptcy has an impact on the stakeholders, including shareholders, creditors, and employees, hence bankruptcy is one of the most challenging and important topics in scientific studies. Since the bankruptcy of a company leads to the spread of the crisis to other financial systems and ultimately causes the creation of a systematic crisis, the issue of bankruptcy due to the economic consequences it has on the economy of countries is a very important place in financial studies. (Saeedian, 2018; Hekmati Farid, Rezazadeh, and Malik, 2017

Bernal,Gnabo, Guilmin,(2014). The problem is that at the level of the country and among the companies accepted in the Tehran Stock Exchange, there are companies that are financially distressed. This can be seen by looking at their financial statements and the reports of auditors and legal inspectors, for example, some of these companies are facing problems in repaying their debts, they do not have the necessary returns to cover their costs, in fact, All these issues indicate that these companies are involved with Financial distress, which may eventually lead to their bankruptcy and breakup. In this way, resources in these companies, which could have been invested in profitable and value-creating opportunities, have been wasted, and from a general point of view, they will have a negative impact on macroeconomic indicators, and this is while the country is in dire need of optimal allocation of production resources and job creation (Heidari et al.; 2014; Zeraati and Nakhai; 2014; Qalibaf and Afshar; 2014).

Determining the exact reason or reasons for bankruptcy and financial problems in each particular case is not an easy task. In most cases, several reasons lead to the phenomenon of bankruptcy. However, according to the conducted research, the main reasons for bankruptcy are financial and economic problems (Heidari et al., 1400; Kiani-Rad et al., 1401).

In some cases, the reasons for bankruptcy are determined by examining financial statements and records. Accountants who have experience in analyzing the financial situation of deteriorating companies can easily identify and determine the reasons for bankruptcy. But sometimes some issues support the proper turnover in a business unit in a relatively short period of time, it hides bankruptcy from the eyes of accountants (Babajani, Bolo, and Ghazali; 2018).

Therefore, the theoretical foundations and the background of the conducted research should be examined in order to analyze the factors, models, and methods of bankruptcy .This research is innovative from several perspectives. No previous study has examined the position of Iranian English-language articles on the international stage. Additionally, it is the first time that corporate bankruptcy and financial crises are investigated using VOSviewer software. It is further noted that, with the help of the drawn map, a method for identifying research gaps and a proposed solution to address them have been presented. This research introduces a novel approach to the field.

2- Theoretical Framework and Research Background

Financial bankruptcy or financial distress refers to the inability to fulfill obligations at the time of maturity and is usually a sign of financial distress and lack of capital in work, which itself is caused by other causes such as weak capital structure, high operating costs, and the like. How to deal with bankruptcy has been one of the most important topics in recent years, and it seems that after more than eight decades, a single definition of it has not yet been provided. In Iran, in a general view, companies face failure in one of three forms: legal (commercial), economic, and financial (Raei et al., 2001).

Commercial (legal) bankruptcy is also defined in Article 412 of the Commercial Law; Bankruptcy of a merchant or a commercial company occurs as a result of stopping the payment of the funds that they are responsible for. Therefore, financial distress is a financial situation and bankruptcy is a judicial legal situation. Economic bankruptcy also occurs when at least half of the company's capital is lost as a result of the losses and is subject to Article 141 of the revised Commercial Law, the board of directors is obliged to immediately call an extraordinary general meeting of shareholders to discuss the issue of breakup or survival of the company.

If the said assembly does not vote to break up the company, it must reduce the capital of the company to the amount of the existing capital in the same meeting and in accordance with the provisions of Article 6 of this law. If a company is subject to Article 141 of the

Trade Amendment Law, all its stock transactions will be blocked (Vakilifar et al., 2014). In another research, the concept of financial bankruptcy threshold has been used to identify bankrupt companies in Tehran Stock Exchange (Homayoun Far et al., 2013). Others have defined bankruptcy as the closing of the symbol in the stock market (Dastgir et al., 2017).

Companies usually go bankrupt under the influence of various and related factors, so it is not easy to determine the reason or reasons for the occurrence of financial problems in each particular case. In a general classification, bankruptcy caused by external factors (extra-organizational) and internal factors (intra-organizational) has been defined. External factors include parameters that cannot be controlled by the company but cause financial problems for the company. These factors can be defined as follows: characteristics of the economic system, changes in economic structures, changes in trade, trade fluctuations, problems related to financing, natural events and disasters, competition intensity in the market, inconsistency, unemployment decrease in the rate of sales, inflation, falling prices, and increasing interest rates.

Internal factors also include items that are mentioned below creation and development of more than the amount of credit to customers (excessive credit sales), inefficient management (lack of training, experience, ability, and management initiative in the field). Competition and technology and resources and management errors), inability to manage the impact of capital, betrayal, fraud, etc. (Kiani et al., 2022; Heydari et al., 2021). One of the tools used to decide to invest in a company is bankruptcy prediction models, some of which are:

1) Beaver model
2) Altman model
3) Springgate model
4) Zaugin model
5) Grace model
6) Fulmer's model
7) Philosopho model
8) Artificial neural network model
9) Ohlson model
10) Zmijewski model
11) C-square model.

Kiani Rad et al.(2022), in research entitled Designing a model for assessing the financial fragility of companies listed in the Iran Stock Exchange using the structural equation method, a six-level model consisting of 28 independent and related variables was investigated. The most influential variable and the only independent variable of the financial fragility assessment model of this research was economic stability. Zeraati and Nakhaai (2021) investigated the relationship between bankruptcy and stock overvaluation and profit management and managers' overconfidence. The results of the research hypotheses test showed that in the investigated companies in this period, bankruptcy has a strong significant negative relationship with stock overvaluation, a weak significant negative relationship with profit management, and a strong significant positive relationship with managers' overconfidence. Heydari et al. (2021) investigated two bankruptcy prediction models using a neural network and firefly meta-heuristic algorithm in Tehran Stock Exchange. The findings of this research showed that the neural network optimized by the firefly algorithm has a better performance than the post-error propagation neural network in predicting the bankruptcy of the sample companies. Also, the firefly algorithm has well preserved the ratio between bankrupt and non-bankrupt companies, just like the real data.

Papik et al. (2023) acknowledged in an article: predicting company bankruptcy is a field that is mainly developed by the introduction of big data and data mining and their application in the real business environment.

In the field of classification methods, set methods, including different algorithms of packing or strengthening, have a significant place. One of the newest algorithms in this field is the CatBoost algorithm, which was developed in 2018. The forecasting model was built on a data sample of 89,447 small and medium-sized companies (of which 295 were bankrupt) in 2019 in Slovakia. This model outperformed other models by applying only financial or class variables. The findings of this article indicated that the use of categorical variables could contribute to better results than the use of pure financial variables in CatBoost models.

Iqbal et al. (2022) from Pakistan stated in the research: whether logistic regression (LR) and neural network (NN) can estimate the bankruptcy of PSX non-financial companies one year before bankruptcy. In this paper, they specifically try to check how accurate are LR and NN models. Financial ratios were

used to predict the bankruptcy of companies. Although both models are capable of predicting bankruptcy, current research shows that the use of neural networks (NN) increases the prediction accuracy with a superior approach to the logistic regression method (this is based on the level of accuracy previously achieved by NN over LR).

Hosaka, T. (2019) The results showed that bankruptcy predictions by trained network have higher performance compared to methods that use decision trees, linear discriminant analysis, support vector machines, multilayer perceptron, AdaBoost, or Altman's Z'-score.

Klistek et al. (2018) stated: Every company has an economic and moral responsibility toward its shareholders to perform well financially. However, the number of bankruptcies in Slovakia has been increasing for several years for no apparent macroeconomic reason. Robust analysis using conventional bankruptcy prediction tools showed that the existing models are compatible with local conditions, especially local laws. In addition, it was confirmed that most of these old tools have sufficient capability to warn about impending financial problems several years in advance. In this research, a new bankruptcy prediction tool that outperforms conventional models was developed. However, predicting bankruptcy risk is increasingly challenging as companies have become more global and complex, developing sophisticated schemes to hide their true situation under the guise of "optimization" for tax authorities.

Altman et al. (2017), in their research, evaluated the classification performance of the Z-Score model in predicting bankruptcy and other types of company crises, with the aim of examining the usefulness of the model for all companies. Analyzed the performance of the Z-Score model for companies from 31 European countries and 3 non-European countries using different modifications of the original model. This study was the first to provide such a comprehensive international analysis. Except for the United States and China, the sample companies are mostly private and include non-financial companies in all industrial sectors. The original Z″-Score model developed by Altman, Corporate Financial Distress: A Complete Guide to Predicting, Avoiding, and Coping with Bankruptcy (1983) was used for private and public manufacturing and non-manufacturing companies. This study provided evidence that the general Z-Score model works well for most countries (prediction accuracy is approximately 0.75) and classification accuracy can be improved using country-specific estimation that includes additional variables (above 0.90).

According to Salehi et al., special importance should be attached to predicting bankruptcy, because bankruptcy is the last stage in which a company still has economic life. Forecasts should be based on the analysis of information and data, as well as the logical and correct interpretation of information to help make the right economic decisions. They believe that by creating and expanding financial crisis prediction models, management can be warned about current activities and investors about buying shares or granting loan facilities to companies, as well as economic decisions to managers. (Salehi et al. 2016).

Sun et al. (2014): As a hot topic, financial distress prediction (FDP), or bankruptcy prediction, plays an important role in decision-making in various fields including accounting, finance, business, and engineering. In a review article, they reviewed the current FDP literature from the following four unique aspects: defining financial distress in the new century, FDP modeling, sampling approaches for FDP, and approach characteristics for FDP. Considering the new techniques in this field, FDP modeling was classified and reviewed by the following groups: pure single-classifier modeling, hybrid single-classifier modeling, ensemble techniques modeling, dynamic FDP modeling, and group decision-making techniques modeling. Sampling methods for FDP were classified and analyzed by the following paired groups. Namely: educational sampling and experimental sampling, single-industry sampling and inter-industry sampling, balanced sampling, and unbalanced sampling.

3-Methodology

The research method used is a bibliographic review.
The bibliography is a type of statistical measurement method and shows the pattern of communication between authors and texts. In other words, the relationship between authors and sources is measured and determined using statistical methods such as scatter distribution, citation analysis, etc. Therefore, the aim of the bibliography is to perform a kind of quantitative analysis on various sources such as books, visual and audio sources, and other types of sources.

Bibliometric maps are one of the most important subjects in the field of scientometrics. These maps show how topics, authors, countries, and scientific documents are related to each other. The use of bibliometric maps is used to determine the limits of subject areas and to identify their structure and evolution. Also, bibliometric maps are used to analyze scientific data and discover hidden patterns. In this research, VOSviewer software was used to draw maps, which is free software for creating and visualizing bibliographic networks.

VOSviewer software version: 18.6.1 prepared by Nees Jan van Eck and Ludo Waltman is software for creating maps based on network data and for visualizing and exploring these maps, developed in Java programming language. This software can be used to create networks of scientific publications, scientific journals, researchers, research organizations, countries, keywords, or terms. Items in these networks can be connected through co-authorship, co-occurrence, citation, bibliographic link, or co-citation links. To create a network, bibliographic database files (such as Web of Science, Scopus, PubMed, Lens, and, Dimensions files) can be provided as input to VOSviewer.

Although VOSviewer is primarily intended for bibliometric network analysis, it can actually be used to create, visualize, and explore maps based on any type of network data.

The maps that are created, visualized, and explored using this software include items that are topics of interest to researchers, which are displayed by a colored circle, and the larger these circles are, the more significant they are. The weight and importance of that item are more, and the weight of the items is displayed with a non-negative number. Items may be, for example, publications, researchers and authors, or keywords. A map usually only contains one type of item.

Between any pair of items, there can be a link. A link is a connection or relationship between two items that are displayed by a curved or straight-colored line. The greater the thickness of the line and the shorter its length, it means that the relationship between the two items is more and stronger. The strength of each link is displayed with a positive numerical value.

The strength of a link may, for example, indicate the number of citations shared by two publications (in the case of bibliographic pair links), the number of publications co-authored by two researchers (in the case of co-authorship links), or the number of publications in which two terms occur together (in the case of co-occurrence links).

4- Research findings

The scope of publication of the sources used in the upcoming research was selected from among the articles published in Scopus scientific database. The keywords Corporate Bankruptcy, Financial Crisis and predict model were the basic search, and 375 articles were found with these words. The 375 articles under consideration span a diverse array of academic disciplines. To systematically curate pertinent data, advanced search filters were meticulously employed, focusing on critical elements such as authorship details, document titles, citation count, publication status, authors' keywords, indexed keywords, abstracts, and references. Articles were deemed eligible if they were published within the timeframe of 2013 to 2023 and appeared in journals and trade publications germane to the domains of financial engineering, business, accounting, economics, and management. Following the meticulous application of these refined filters, the cohort of accepted articles narrowed down to 115. Subsequently, the relevant information pertaining to these articles was methodically extracted, formatted in CSV Excel, and provided to the software tasked with generating bibliographic maps. For the purpose of enhancing accuracy, this assessment was reevaluated and updated on November 24, 2023.

The search formula was as follows:

(TITLE-ABS-
KEY (corporate AND bankruptcy) AND TITLE-
ABS-KEY (financial AND crisis) AND TITLE-
ABS-KEY (predict AND model) AND
AND (LIMIT-
TO (PUBYEAR , 2023) OR LIMIT-
TO (PUBYEAR , 2022) AND (LIMIT-
TO (SUBJAREA , "ECON") OR LIMIT-
TO (SUBJAREA , "BUSI")) AND (LIMIT-
TO (DOCTYPE , "ar") OR LIMIT-
TO (DOCTYPE , "cp") OR LIMIT-
TO (DOCTYPE , "bk")) AND (LIMIT-
TO (LANGUAGE , "English")) AND (LIMIT-
TO (SRCTYPE , "j") OR LIMIT-
TO (SRCTYPE , "p") OR LIMIT-
TO (SRCTYPE , "d")) AND (LIMIT-

TO (PUBSTAGE , "final") OR LIMIT-
TO (PUBSTAGE , "aip"))

Continuing, the annual publication trend in this field was scrutinized from the beginning to the present in the scientific database of Scopus. Subsequently, the level of activity in various countries and the publication status of Iranian authors' articles were analyzed. Finally, a co-occurrence map of keywords, accompanied by the clustering of these terms, was presented.

As depicted in the chart, the horizontal axis represents the publication years, and the vertical axis illustrates the number of published articles each year. The first article in this domain was authored in 1989. This article, titled "Predicting corporate failures of Class I less-than-truckload motor carriers," was authored by Wu Haw-Jan and has received 16 citations in Scopus to date. Also the latest indexed article in Scopus is authored by Gatti et al. With the title Corporate Bankruptcy and Directors' Reputation: An Empirical Analysis of the Effects on Public Debt Contracts and it has received 1 citation to date.

Over the course of its 34-year presence in the academic database, the field of Bankruptcy and Financial Crisis has experienced publication fluctuations. The years 2004 to 2006 represent a period of declining publications. However, after a noticeable decline in 2017, with the registration of 13 articles in 2018, this trend of publications gained renewed momentum. Upon reviewing articles in the pipeline, it was revealed that only one more article in this domain remains in Scopus. Therefore, the record for the year 2023 will be closed with 12 articles, highlighting 2018 as the golden year of publications in the field of Corporate Bankruptcy and Financial Crisis from inception to the present
In the subsequent phase, countries will be introduced based on their highest publication rates in the field of corporate bankruptcy and financial crises. Additionally, an examination of Iran's position relative to other countries will be conducted in this context.

The vertical axis of this chart displays the names of countries actively engaged in publishing scientific articles in the field of corporate bankruptcy and financial crises. And the horizontal axis illustrates the number of published articles for each country. As evident, the United States leads in this field with 25 articles, followed by the United Kingdom with 17 articles, and Spain with 7 articles in the subsequent positions. The publication position of articles by Iranian authors in this field is noteworthy. Iran, with the publication and indexing of two articles in Scopus, has achieved a ranking higher than countries such as Canada, Finland, Hong Kong, and the Netherlands.

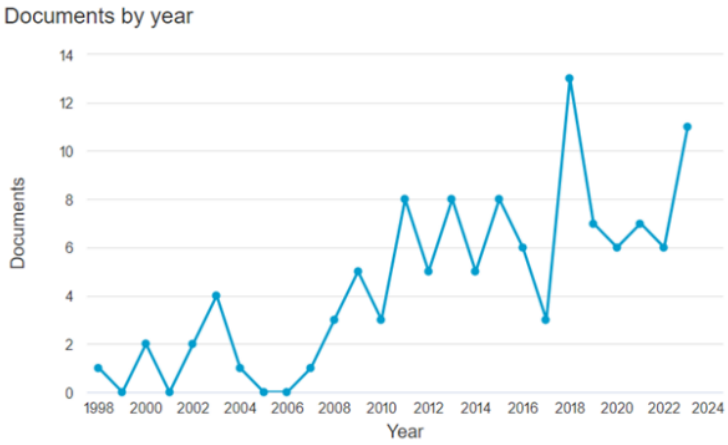

Fig1. The trajectory of publishing articles in the field of Corporate Bankruptcy and Financial Crisis from inception to the present Source: www.scopus.com

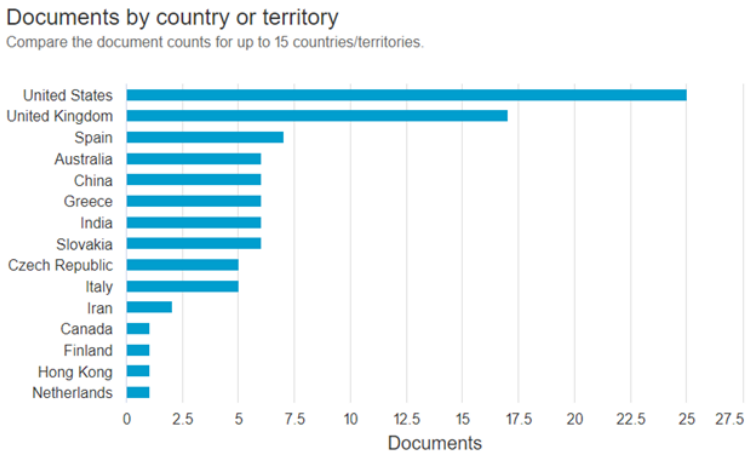

Fig2. The number of published articles by each country Source: www.scopus.com

Both of these articles are authored by Mahdi Salehi of Ferdowsi University of Mashhad, who, along with colleagues, successfully indexed these articles in 2016. To date, they have received 20 citations in Scopus for the article titled Bankruptcy prediction of listed companies on the Tehran Stock Exchange and 16 citations for the article titled Predicting corporate financial distress using data mining techniques: An application in Tehran Stock Exchange.

After reviewing the publication years and countries of the articles, the co-occurrence map of keywords is presented below.

The "co-occurrence of keywords" refers to the frequency with which specific words or phrases appear together within a given context, document, or dataset. Analyzing the co-occurrence of keywords is a common practice in various fields. Analyzing the co-occurrence of keywords provides valuable insights into the structure and content of textual data, helping researchers and algorithms understand the context and relationships between different terms.

Each keyword has been assigned a circle and line(s) or link(s). The size of these circles and the length and thickness of the links vary. The larger the circle, the more frequently the corresponding keyword is used alongside other keywords. Similarly, an increased number of lines and links extending from a circle also convey the same meaning. Furthermore, two circles connected by a line represent co-occurrence. The shorter and thicker the connecting lines, the closer the relationship between those two keywords.

The data of 115 downloaded articles has been provided to the software, and Vosviewer is utilized to visualize the co-occurrence map of keywords. The authors had indexed 180 keywords in their articles. As the researcher's request, keywords that had created a co-occurrence three times were selected. The number of these keywords was 25. Subsequently, the researcher manually examined the keywords, filtering out redundant and disproportionate terms such as specific names and companies and countries. In this way, 16 keywords passed the filter, and a co-occurrence map was made based on this number.

Taking into account the explanations provided earlier, a general overview of the map indicates that the keyword (financial crisis) has experienced the highest level of co-occurrence. Following that, keywords related to (bankruptcy), (forecasting), and (finance) are positioned in subsequent ranks. The words that had a stronger connection with each other are displayed in the form of clusters.

Clusters in this software serve to delineate distinct relationships and patterns within the data, facilitating researchers in discerning more meaningful patterns and classifications in their datasets.

For the 16 keywords, four clusters have been formed, and they are presented in the table below.

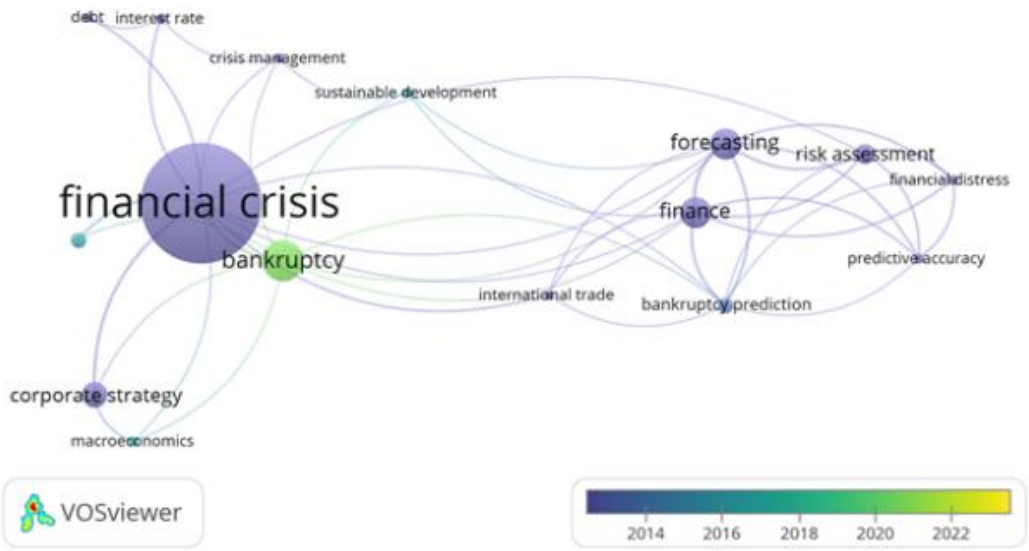

Fig 3. Co-occurrence of indexed keywords

Table1. Clustering of co-occurring indexed keywords.

number	title	Number of items	Sub-cluster
1	Bankruptcy prediction	6	Bankruptcy prediction ,Finance, financial distress, forecasting, predictive accuracy, risk assessment
2	financial crisis	5	Corporate strategy, financial crisis ,bankruptcy, macroeconomics, performance assessment
3	Crisis management	4	Crisis management, debt, interest rate, sustainable development
4	International trade	1	International trade

As the presence of a line indicates a connection between items, the absence of a line signifies a research gap. Therefore, by scrutinizing the map and identifying words that lack a connecting line, research gaps can be recognized and efforts can be made to address them. This approach allows the identification of numerous research topics. For example, one could focus on "debt, corporate strategies, and financial distress" as the primary themes of a study. The next section is devoted to introducing the most cited articles in the field of bankruptcy and financial crises.

Among the 115 documents extracted from Scopus scientific database, according to the researcher's request, 11 documents were found that were cited at least 100 times. The map of these 11 documents was made as above.

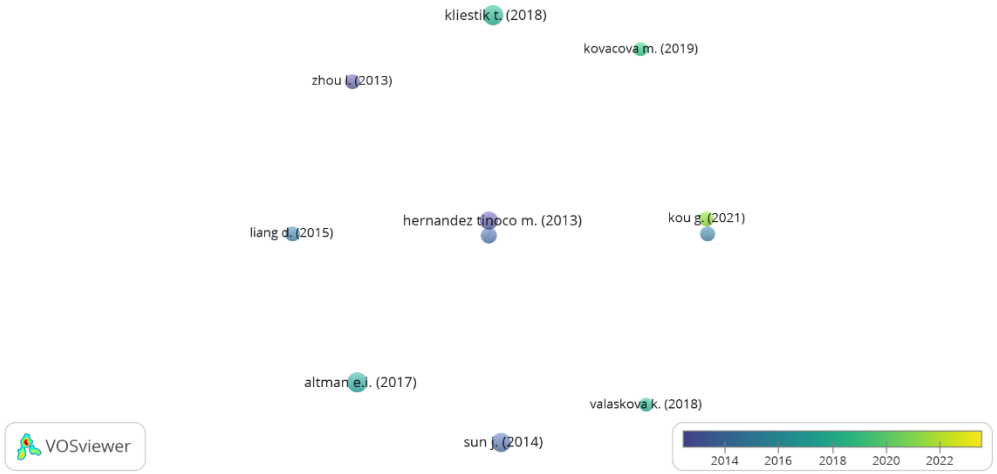

Fig4. Overlay map of most cited documents

Table2. The most cited articles

rank	Author/s	topic	Publication year	Number of citations
1	Altman et al.	Financial Distress Prediction in an International Context: A Review and Empirical Analysis of Altman's Z-Score Model	2017	۲۲۸
2	Keliestik		2018	۲۱۳
3	Sun	Bankruptcy Prevention: New Effort to Reflect on Legal and Social Changes	2014	۱۹۳

5- Discussion and Conclusion

Since academic research on bankruptcy has been going on for nearly eighty years, there is a lot of literature on this field, which may seem chaotic and confusing for researchers in this field (Sun et al., 2014). The importance of predicting bankruptcy is because the last stage of the economic life of companies affects all the stakeholders of the business unit. (Salehi et al., 2016), The lack of training, experience, ability and initiative of management, lack of cooperation and effective communication between management and professionals make it difficult for a business unit to remain in the field of competition and technology, and most of the bankruptcies were due to these reasons. Several researchers have examined different models of bankruptcy in order to provide the best model for predicting bankruptcy and reached different results, for instance, the guidance of Roudposhti et al. Colleagues in 2009, Soleimani and Nikoomaram2008, Raei, and Fallahpour2004, and Mehranei et al 2005. Salehi et al., 2016 considered the last stage of a company's economic life as bankruptcy and therefore believe that more importance should be given in research to predict bankruptcy and present a model in this field. They believe that by creating and expanding financial crisis prediction models, management can be warned about current activities and investors about buying shares or granting loan facilities to companies, as well as economic decisions to managers. This paper contributes to future research by providing a comprehensive summary, analysis, and assessment of the current bankruptcy literature.

According to Fig 1, it depicts the trend of article publications from 1989 to 2023, highlighting the years of recession and peaks. It also identifies the first article in the field of corporate bankruptcy and financial crises, as well as the most recent article in this domain.

Fig 2 illustrates the most active countries in producing articles on corporate bankruptcy and financial crises. It reveals that the United States is a leader in this field and demonstrates that Iran's publication level surpasses many advanced countries

in this area. Salahi et al. indexed two articles in this field in the year 2016.

Figure 3 depicted the co-occurrence of indexed keywords and identified that the term "financial crisis" had the highest co-occurrence. Subsequently, in Table 1, it clustered the keywords and displayed them with main groups and sub-clusteres. Also, researchers can find numerous research topics related to this field by examining links and nodes.

In conclusion, the method of identifying research gaps using the co-occurrence map of keywords was explained, and an example, including the words "debt, corporate strategies, and financial distress" was provided.

In Figure 4, the most cited bankruptcy articles were displayed, the three most cited articles include

- Financial Distress Prediction in an International Context: A Review and Empirical Analysis of Altman's Z-Score Model
- Bankruptcy Prevention: New Effort to Reflect on Legal and Social Changes
- Predicting financial distress and corporate failure: A review from the state-of-the-art definitions, modeling, sampling, and featuring approaches.

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